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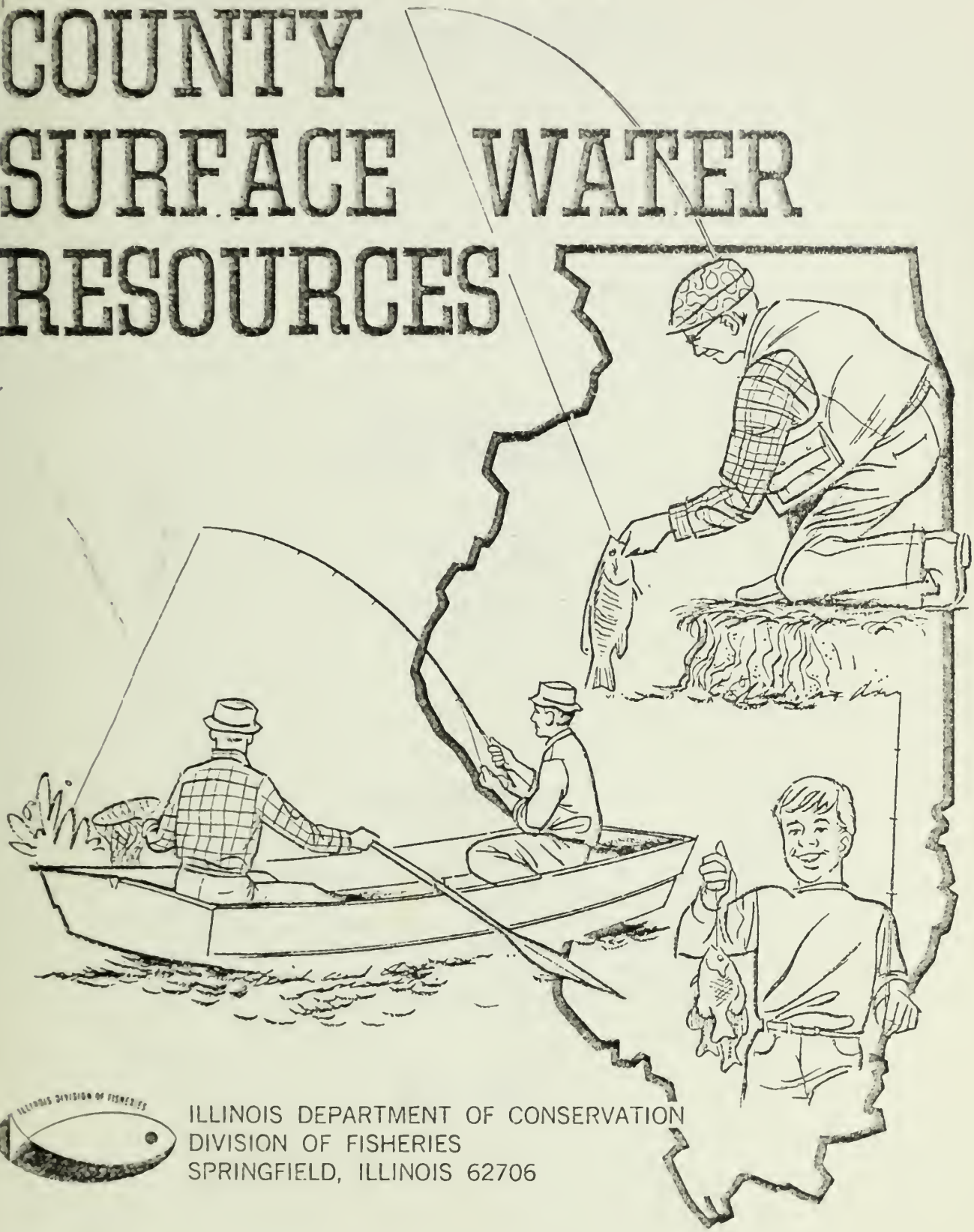
WILLIAMSON COUNTY SURFACE WATER RESOURCES



ILLINOIS DEPARTMENT OF CONSERVATION
DIVISION OF FISHERIES
SPRINGFIELD, ILLINOIS 62706

ACKNOWLEDGEMENTS

DATA FOR THIS REPORT WAS OBTAINED FROM INFORMATION AVAILABLE IN THE FILES OF THE DEPARTMENT OF CONSERVATION, AND OTHER COUNTY AND STATE AGENCIES ASSOCIATED WITH CONSERVATION. THE REPORT WAS EDITED BY O. M. PRICE, AREA FISHERY BIOLOGIST AND A. C. LOPINOT, CHIEF FISHERY BIOLOGIST. THE FINAL MANUSCRIPT FOR PRINTING WAS TYPED BY ANN HAVEY, TYPIST.

ILLINOIS DEPARTMENT OF CONSERVATION
DIVISION OF FISHERIES

WILLIAMSON COUNTY SURFACE WATER RESOURCES

BY

JAMES S. ALLEN
&
TOM WAYNE
FISHERY BIOLOGISTS

MARCH 1974

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Natural History Survey

PREFACE

THE HIGHER STANDARD OF LIVING ENJOYED TODAY BY ILLINOIS' CITIZENS HAS RESULTED IN AN INCREASED AMOUNT OF LEISURE TIME TO PURSUE OUTDOOR RECREATION. THERE HAS BEEN AN INCREASED INTEREST IN BOATING, SAILING, CANOEING, WATER-SKIING, FISHING, SKIN DIVING, AND OTHER WATER ASSOCIATED SPORTS. DEMANDS BY INDUSTRY, AGRICULTURE AND URBAN EXPANSION HAVE ALSO PLACED HEAVY BURDENS ON SURFACE WATERS. IT IS TIME TO TAKE STOCK OF OUR EXISTING AND POTENTIAL RESOURCES AND PROBLEMS TO PLAN FOR THE FUTURE.

A COUNTY WATER RESOURCE REPORT, SUCH AS THIS ONE, IS AN ATTEMPT BY THE DIVISION OF FISHERIES OF THE ILLINOIS DEPARTMENT OF CONSERVATION TO SUMMARIZE DATA ON THE MORE IMPORTANT EXISTING WATER RESOURCES AND THEIR RECREATIONAL VALUE. WITH THIS DATA AVAILABLE, A METHOD TO APPORTION USAGE OF WATER IN THE BEST INTEREST OF THE PUBLIC CAN BE DETERMINED TOGETHER WITH THE POTENTIAL NEEDS.

THIS INVENTORY IS AN EXTENSIVE SURVEY OF THE SURFACE WATER RESOURCES AND RELATED ITEMS IN WILLIAMSON COUNTY. EMPHASIS HAS BEEN PLACED ON THE AREAS OF GREATEST USE AND RECREATIONAL VALUE. THE INFORMATION PROVIDED IN THIS REPORT HAS BEEN OBTAINED FROM PAST RECORDS ON FILE IN THE ILLINOIS DEPARTMENT OF CONSERVATION, OTHER CONSERVATION AGENCIES, AND DATA COLLECTED BY FISHERY BIOLOGISTS AND FISH CONSERVATION AGENTS.

IN 1964, WITH THE PUBLICATION OF "ILLINOIS SURFACE WATER INVENTORY", THE DIVISION OF FISHERIES PROVIDED THE STATE WITH THE FIRST STATISTICAL SUMMARY OF SURFACE WATER RESOURCES. THIS WAS A COMPILATION OF WATERS IN EACH COUNTY WITH NO EVALUATION AS TO THEIR USE. IN ORDER TO HAVE MORE COMPLETE DATA AVAILABLE FOR PLANNING, THE DIVISION OF FISHERIES INAUGURATED A PROGRAM IN 1966 WHEREBY DETAILED WATER RESOURCE REPORTS WERE TO BE PREPARED FOR EACH OF THE 102 COUNTIES IN ILLINOIS.

THESE REPORTS SHOULD ASSIST IN LONG-RANGE PLANNING AND DEVELOPMENT OF THE STATES WATER RESOURCES TO MEET THE NEEDS OF THE FUTURE.

A. C. LOPINOT
CHIEF FISHERY BIOLOGIST

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ABSTRACT

WILLIAMSON COUNTY, LOCATED IN SOUTHERN ILLINOIS ABOUT 100 MILES SOUTHEAST OF ST. LOUIS, MISSOURI, CONTAINS BOTH GLACIATED AND UNGLACIATED TOPOGRAPHY. THE NORTHERN TWO-THIRDS OF THE COUNTY WAS COVERED BY THE ILLINOIAN GLACIER AND IS CHARACTERIZED BY MATURE TOPOGRAPHY OF LOW RELIEF WITH UPLAND PRAIRIES AND BROAD VALLEYS ALONG THE LARGER STREAMS. THE SOUTHERN THIRD OF THE COUNTY IS CHARACTERIZED BY ROLLING PASTURE LANDS AND TIMBERED HILLS AND LIES IN THAT PART OF THE STATE KNOWN AS THE "ILLINOIS OZARKS".

THE CLIMATE IS CONTINENTAL WITH A GROWING SEASON OF ABOUT 190 DAYS, A TEMPERATURE RANGE OF ABOUT 100 DEGREES FAHRENHEIT AND AN ANNUAL RAINFALL OF ABOUT 43 INCHES.

THERE ARE 13 FEDERAL, PUBLIC AND ORGANIZATIONAL LAKES OF 6.0 SURFACE ACRES OR LARGER WITH A COMBINED TOTAL OF 10,208.5 ACRES. NINE OF THESE ARE OPEN TO PUBLIC FISHING. IN ADDITION THERE ARE APPROXIMATELY 1,800 PRIVATELY OWNED LAKES AND PONDS COMPRISING ABOUT 2,176 ACRES OF WATER. THE COUNTY HAS FOUR FEE FISHING AREAS. LARGEMOUTH BASS, BLUEGILL AND REDEAR SUNFISH ARE PRODUCED AT THE STATE FISH HATCHERY NEAR LITTLE GRASSY LAKE. THERE ARE FOUR PRINCIPAL STREAMS WITH A COMBINED LENGTH OF 68 MILES AND AN AREA OF ABOUT 267 ACRES.

WITH 49,021 RESIDENTS IN 1970, WILLIAMSON COUNTY RANKED 26TH IN POPULATION AMONG THE 102 COUNTIES IN ILLINOIS. THE POPULATION IS EXPECTED TO REMAIN FAIRLY CONSTANT THROUGH THE 70'S AND INCREASE TO 62,000 BY 2020. IN 1970 THE POPULATION DENSITY WAS 115 PER SQUARE MILE IN THE COUNTY WHICH ENCOMPASSES AN AREA OF 427 SQUARE MILES.

CRAB ORCHARD, LITTLE GRASSY, DEVIL'S KITCHEN AND LAKE OF EGYPT ARE THE PRINCIPAL SPORT FISHING IMPOUNDMENTS OPEN TO PUBLIC FISHING. ALL CONTAIN A VARIETY OF FISHES, THE MOST IMPORTANT OF WHICH, FROM A SPORT FISHING STANDPOINT, ARE LARGEMOUTH BASS, BLUEGILL AND CRAPPIE. CRAB ORCHARD LAKE ALSO HAS A GOOD POPULATION OF CHANNEL CATFISH.

STREAM POLLUTION IN THE FORM OF SILTATION AND ACID MINE WASTES IS THE MOST IMPORTANT SURFACE WATER PROBLEM. THE USE OF PESITICIDES, THE LONG RANGE EFFECTS OF EFFECTS OF WHICH ARE IMPERFECTLY UNDERSTOOD, ALSO POSES AN ENVIRONMENTAL PROBLEM.

GENERAL SETTING OF THE SURFACE WATERS IN WILLIAMSON COUNTY

Williamson County is located in southern Illinois about 100 miles southeast of St. Louis, Missouri. The county was established on February 28, 1839 and was named after a county in Tennessee (Barrett, 1952). Marion is the county seat.

It is made up of 12 complete townships and measures 18 miles north to south and 24 miles east to west. The county is bordered on the north by Franklin County, on the south by Johnson and Union counties, on the east by Saline County and on the west by Johnson County.

Of Illinois' 102 counties, it ranks 69th in area with 427 square miles and 26th in population in 1970 when there were 49,021 residents (Ill. Coop. Ext. Service, 1971). The population is 59.2% urban (Peterson, 1967).

Transportation facilities include Interstate Route 57 running north and south, several state routes, the more heavily traveled being Routes 37 and 148 running north and south and Route 13 running east and west and an extensive network of secondary state routes and all-weather roads. The county is also served by the Missouri Pacific, Illinois Central, Chicago, Burlington and Quincy, Chicago and Eastern Illinois and Penn Central railroads.

A wide annual temperature range of about 100 degrees occurs in the county with maximums near 100° F. and minimums near zero. Annual precipitation is about 43 inches per year. May is normally the wettest month and October the driest.

PHYSIOGRAPHY

The topography is generally level to gently rolling over most of the county with low hills occurring along the eastern portion and somewhat more relief between hills and valleys along the southern boundary. Total relief is approximately 385 feet. Maximum elevation reaches to about 725 feet above mean sea level (M.S.L.) southeast of Devil's Kitchen Lake near the Union County border. The lowest elevation is about 340 feet; the point where the Big Muddy River passes from Williamson into Jackson County.

CLIMATE

Williamson County has the continental climate typical of southern Illinois, with maximums near 100 degrees Fahrenheit and minimums near zero. Continuous warm periods can be prolonged, since cool air invasions from the north often fail to penetrate as far south as Williamson County during the summer. Temperature is recorded at the Marion weather station; however, at Carbondale in Jackson County, January is normally the coldest month and July the warmest. The highest temperature recorded at Carbondale was 113 degrees and the lowest -24.

Annual precipitation, as recorded at the Marion weather station, is about 43 inches, ranging from 2.6 inches for the driest month (October) to about 4.5 inches for the wettest (May). The nearest snowfall recording station is at Harrisburg in Saline County, where an annual average of 14.8 inches has occurred. In a 10-year period beginning in 1951, the greatest total for one month was 17.2 inches in March of 1960. The snowfall for that year was 33.7 inches. In only one of the ten years, not enough snow fell to be recorded (U. S. Dept. of Commerce, 1964).

The growing season, based upon the average date of the last freezing temperature (32° F or below) in the spring and the average of the first such temperature occurrence

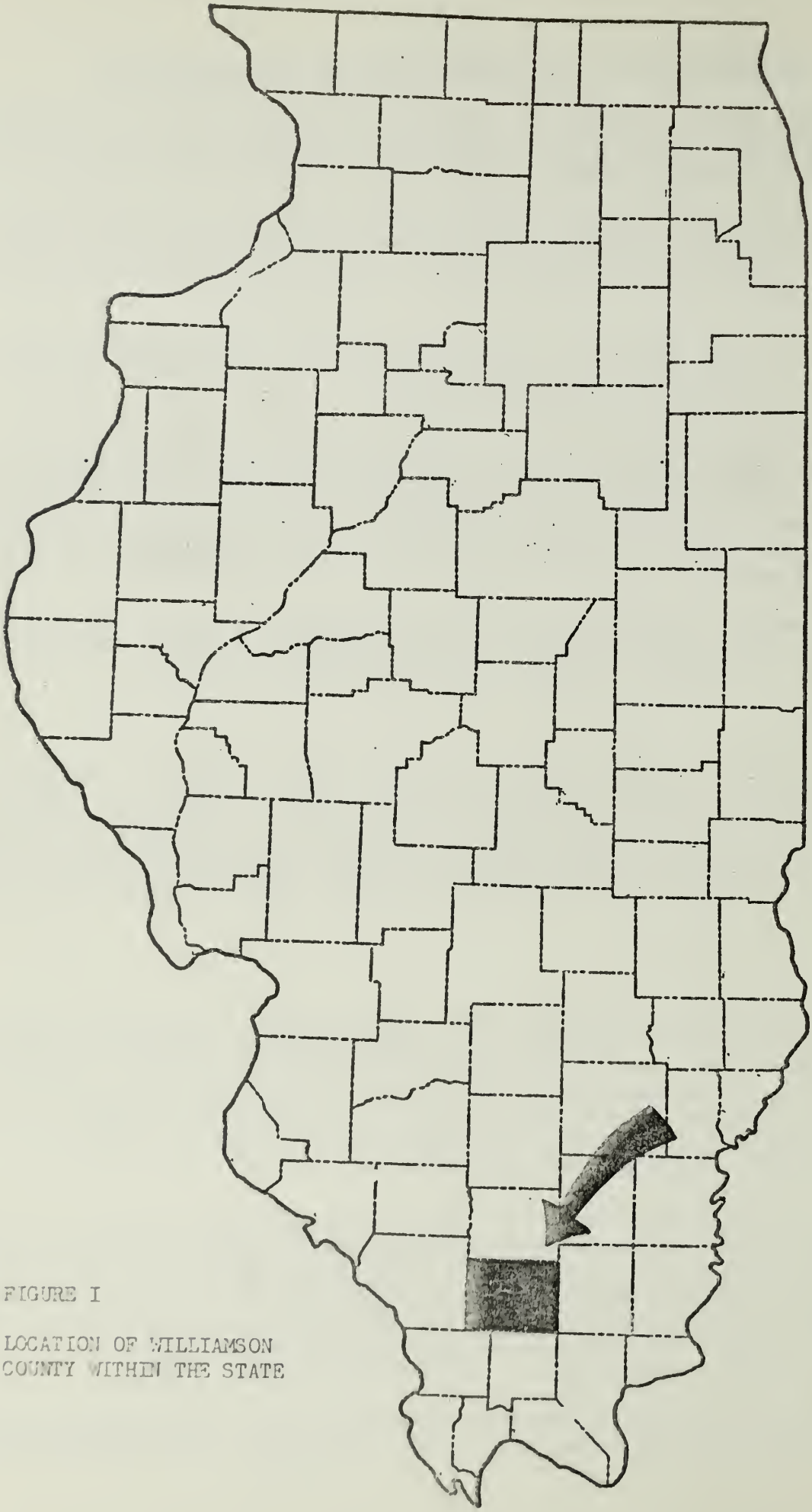


FIGURE I

LOCATION OF WILLIAMSON
COUNTY WITHIN THE STATE

IN THE FALL, IS APPROXIMATELY 190 DAYS IN WILLIAMSON COUNTY (JOOS, 1960).

GEOLOGY

THERE ARE TWO PHYSIOGRAPHIC DIVISIONS IN WILLIAMSON COUNTY. THE NORTHERN TWO-THIRDS OF THE COUNTY LIES IN THE TILL PLAINS SECTION OF THE CENTRAL LOWLAND PROVINCE. THE MT. VERNON HILL COUNTY, A SUB-DIVISION OF THE TILL PLAINS SECTION, COMPRISES THE SOUTHERN PORTION OF THE ILLINOIAN GLACIER AND IS CHARACTERIZED BY MATURE TOPOGRAPHY OF LOW RELIEF WITH RESTRICTED UPLAND PRAIRIES AND BROAD ALLUVIATED VALLEYS ALONG THE LARGER STREAMS. A RELATIVELY COMPLETE DRAINAGE SYSTEM EXISTS AND MOST STREAMS HAVE BROAD TERRACED VALLEYS AND LOW GRADIENTS. NATURAL DRAINAGE IS GOOD THROUGHOUT THE UPLAND AREA, BUT THE LARGER VALLEY BOTTOMS ARE POORLY DRAINED. EXTENSIVE AGGRADED LOWLANDS ALONG THE BIG MUDDY RIVER BASIN ARE OUTSTANDING PHYSIOGRAPHIC FEATURES. THE PRESENT LAND SURFACE IS PRIMARILY A BEDROCK SURFACE OF LOW RELIEF, WHICH IS ONLY SLIGHTLY MODIFIED AND SUBDUED BY THE ILLINOIAN DRIFT WHICH IS THIN IN THE AREA.

THE SOUTHERN THIRD OF THE COUNTY IS IN THE SHAWNEE HILLS SECTION OF THE INTERIOR LOW PLATEAUS PROVINCE. THIS AREA INCLUDES A COMPLEX DISSECTED UPLAND UNDERLAIN BY MISSISSIPPIAN STRATA OF VARIED LITHOLOGY. POPULARLY REFERRED TO AS THE "ILLINOIS OZARKS", THE AREA INCLUDES PARTS OF SEVERAL COUNTIES, THE PRINCIPAL ONES LYING SOUTH OF WILLIAMSON COUNTY. LOESS DEPOSITION AND VALLEY ALLUVIATION WERE THE PRINCIPAL EVENTS DURING THE GLACIAL PERIOD (LEIGHTON, ET AL., 1948).

THE MINERAL FUELS, COAL AND PETROLEUM, ARE THE LEADING MINERAL PRODUCTS OF ILLINOIS, MAKING UP ABOUT 70 PERCENT OF THE ANNUAL VALUE OF ALL MINERALS PRODUCED IN THE STATE. WILLIAMSON COUNTY IS A MINOR PRODUCER OF OIL BUT A MAJOR PRODUCER OF COAL, THE LATTER BEING MINED BOTH UNDERGROUND AND IN STRIP MINES (FRYE, 1961).

DRAINAGE

WILLIAMSON COUNTY IS DRAINED BY THREE PRINCIPAL SYSTEMS: THE BIG MUDDY RIVER, TRIBUTARIES TO THE SALINE RIVER, AND CRAB ORCHARD CREEK.

FROM CORINTH, IN THE NORTHEAST PART OF THE COUNTY, WESTWARD SURFACE WATER DRAINS INTO THE BIG MUDDY RIVER THROUGH A NUMBER OF TRIBUTARIES, SOME OF WHICH HAVE BEEN DREDGED AND STRAIGHTENED TO FACILITATE FLOW. THE BIG MUDDY LEAVES THE COUNTY SOUTH OF HURST.

CRAB ORCHARD CREEK AND ITS TRIBUTARIES DRAIN MOST OF THE CENTRAL AND SOUTHWESTERN PORTION OF THE COUNTY INTO CRAB ORCHARD LAKE.

THE EASTERN AND SOUTHEASTERN PARTS OF THE COUNTY DRAIN EASTERLY INTO TRIBUTARIES OF THE SALINE RIVER, WITH THE SOUTH FORK OF THE SALINE BEING THE MAJOR CONTRIBUTOR.

MAJOR IMPOUNDMENTS SUCH AS CRAB ORCHARD LAKE, LITTLE GRASSY, DEVIL'S KITCHEN, AND LAKE OF EGYPT HAVE CHANGED DOWNSTREAM FLOODING FREQUENCIES BY REDUCING THE AMOUNT OF FLOW THAT WOULD HAVE OCCURRED AFTER HEAVY RAINS.

SOILS

"MANY OF THE ITEMS WHICH ASSIST IN THE SATISFACTION OF HUMAN WANTS AND NEEDS ORIGINATE IN SOILS. SOIL IS THE MEDIUM IN WHICH PLANT LIFE GROWS, WHICH IN TURN IS THE FOOD FOR OUR DOMESTIC LIVESTOCK, OUR WILDLIFE, OUR WATERFOWL AND DIRECTLY OR INDIRECTLY, MAN HIMSELF. IN THE ULTIMATE, SOILS SUSTAIN HUMAN LIFE AND WELFARE" (SAWYER, 1970).

TABLE 1

CLIMATOLOGICAL DATA

Temperature						Precipitation	
Month	Mean Daily Maximum	Mean Daily Minimum	Mean Monthly	Record Highest	Record Lowest	Normal Monthly Total	Total Snowfall
Jan.	44.2	25.6	35.5	76	-24	3.67	SNOWFALL DATA NOT AVAILABLE
Feb.	48.1	28.4	38.4	78	-22	3.45	
Mar.	57.8	35.4	46.2	93	-9	4.45	
Apr.	69.2	45.8	57.3	92	20	4.21	
May	78.5	54.3	66.4	101	32	4.46	
June	87.5	63.1	75.6	106	39	3.64	
July	91.9	66.6	78.9	112	43	3.34	
Aug.	90.3	65.0	77.8	113	41	3.98	
Sept.	84.2	57.7	70.5	108	30	3.24	
Oct.	72.9	46.2	59.6	96	16	2.60	
Nov.	57.7	35.4	46.0	88	-1	3.52	
Dec.	47.0	28.3	37.7	74	-10	2.70	

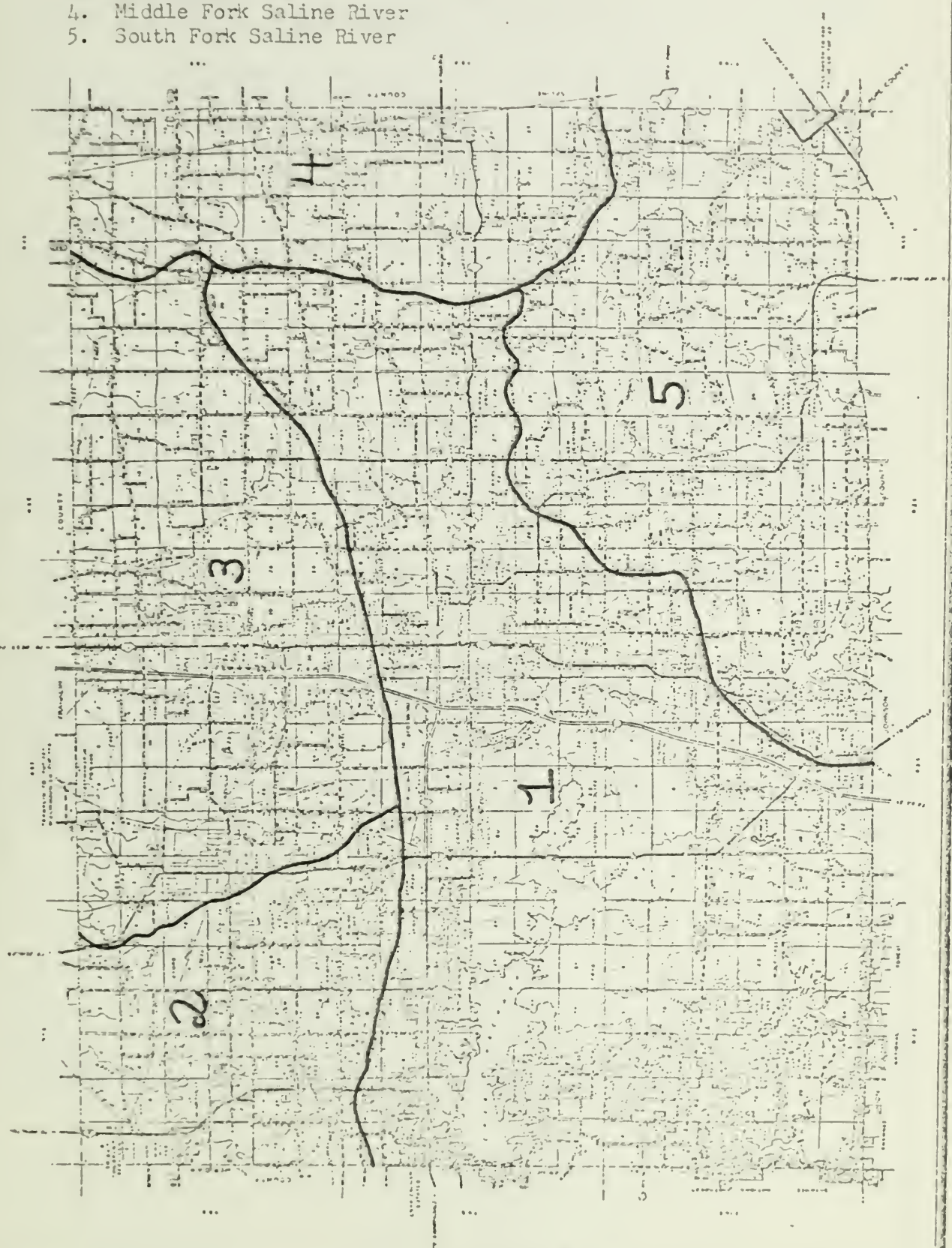
Precipitation records from Marion weather station in Williamson county; other data from Carbondale weather station in Jackson county.

(U.S. Dept. Comm., 1964)

FIGURE 2

MAJOR DRAINAGE BASINS WITHIN COUNTY

1. Crab Orchard Creek
2. Big Muddy River-Hurricane Creek
3. Pond-Lake Creek
4. Middle Fork Saline River
5. South Fork Saline River



SEE PAGE 65 FOR LEGEND

A NUMBER OF FACTORS ARE RESPONSIBLE FOR SOIL DEVELOPMENT. WORKING IN VARIOUS COMBINATIONS, PLANTS, ANIMALS, RELIEF, AND TIME (WALLACE AND FEHRENBACHER, 1969).

MOST WILLIAMSON COUNTY SOILS DEVELOPED FROM GLACIAL TILL, DEPOSITED BY THE ICE OF GLACIERS; LOESS, DEPOSITED BY THE WIND; OR ALLUVIUM AND LAKEBED SEDIMENTS, DEPOSITED BY WATER. OF LESSER IMPORTANCE IS RESIDUUM OR PARENT MATERIAL FORMED IN PLACE BY THE WEATHERING OF SANDSTONE ON THE STEEP, UNGLACIATED SLOPES IN THE SOUTHERN PART OF THE COUNTY (FEHRENBACHER AND ODELL, 1959).

CLIMATE IS IMPORTANT IN SOIL DEVELOPMENT BECAUSE IT INFLUENCES THE TYPE OF VEGETATION GROWING ON SOILS AND ALSO LARGELY DETERMINES THE TYPE OF WEATHERING THAT TAKES PLACE. THE HUMID, TEMPERATE CLIMATE OF THE COUNTY IS CONDUCIVE TO THE GROWTH OF FOREST, ALTHOUGH PRAIRIE GRASS WAS STILL GROWING ON SEVERAL SMALL AREAS AT THE TIME OF SETTLEMENT.

THE DECAY OF FOREST LITTER FORMS CARBONIC AND OTHER ACIDS THAT INCREASE THE RATE OF LEECHING BY DOWNWARD PERCOLATING WATER. EVENTUALLY THE SOILS BECOME HIGHLY ACID AND LEECHED OF MOST OF THE BASES.

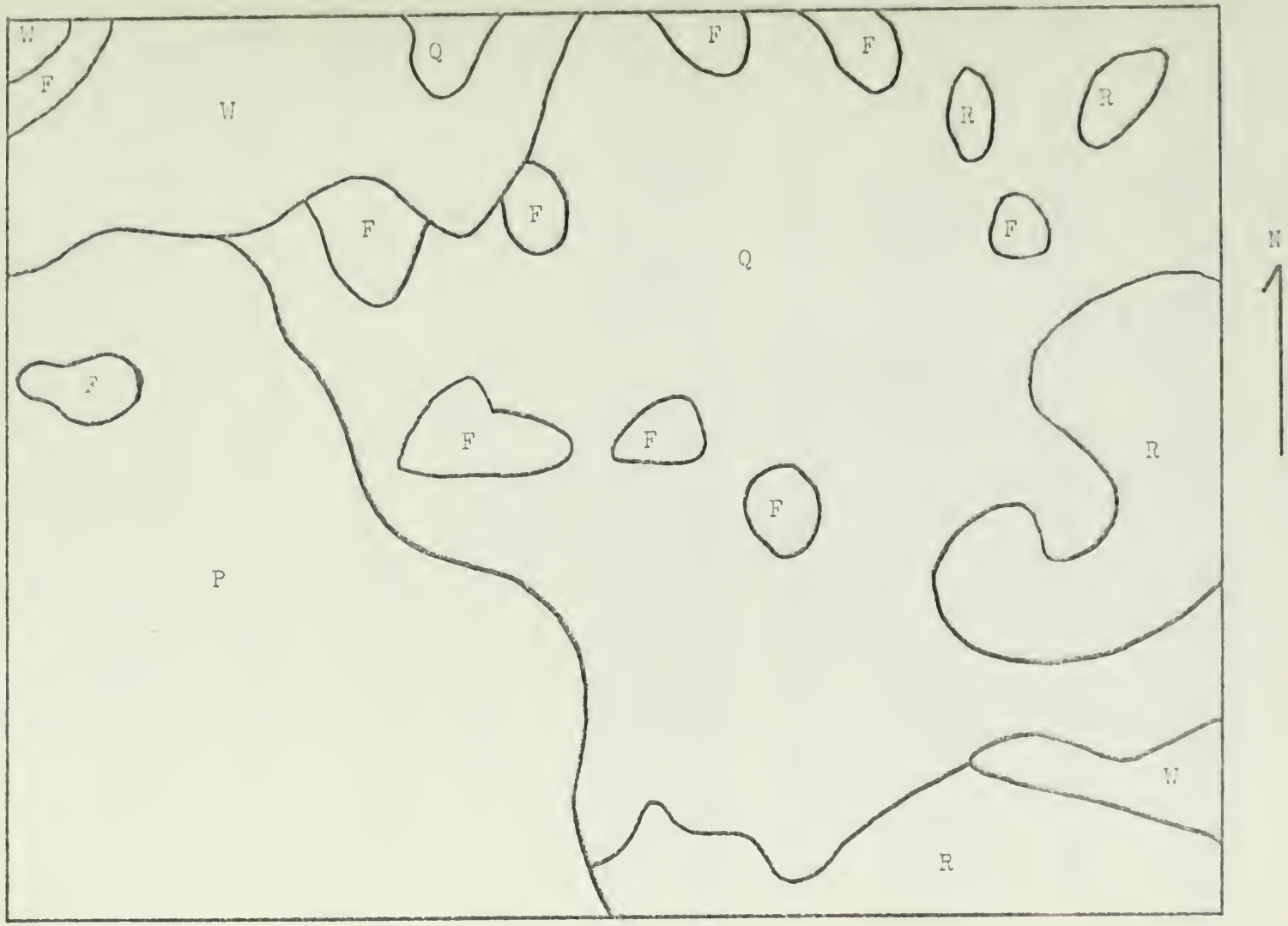
RELIEF INFLUENCES THE AMOUNT OF RUNOFF, INFILTRATION, DRAINAGE WATER, AND ALSO THE DEGREE OF EROSION. IN FLAT AREAS, THE COMBINATION OF RUNOFF FROM HIGHER AREAS AND NORMAL RAINFALL HAS BROUGHT ABOUT A HIGH DEGREE OF SOIL DEVELOPMENT, CAUSING MUCH OF THE CLAY IN THE SURFACE LAYERS TO BE MOVED DOWNWARD FORMING A CLAY PAN. ON MORE SLOPING AREAS WITH LESS WATER MOVING DOWNWARD, SOIL HORIZONS ARE NOT AS STRONGLY DIFFERENTIATED AND CHEMICAL WEATHERING HAS NOT BEEN AS SEVERE. ON STEEP SLOPES, GEOLOGIC EROSION OR THE REMOVAL OF SOIL UNDER NATURAL CONDITIONS MAY ALMOST KEEP PACE WITH SOIL DEVELOPMENT. SOILS ON STEEP SLOPES ARE USUALLY THIN AND WEAKLY DEVELOPED.

TIME AFFECTS SOIL DEVELOPMENT IN RELATION TO OTHER FACTORS. LIME CONTENT, TEXTURE OF PARENT MATERIALS, CLIMATE, AND RELIEF ALL EXERT THEIR EFFECTS WITH RESPECT TO TIME.

A REVIEW OF THE GENERALIZED SOIL MAP SHOWS THAT FERTILITY IS A PROBLEM IN THE COUNTY (FIG. 3). A FISH POPULATION IN TERMS OF POUNDS OF FISH PRODUCED PER SURFACE ACRE OF WATER IS INFLUENCED BY SOIL FERTILITY. PONDS OR LAKES BUILT IN FERTILE SOILS HAVE A GREATER CARRYING CAPACITY THAN WATER AREAS CONSTRUCTED IN INFERTILE SOILS. SOILS LOW IN LIME CONTENT WILL YIELD RUNOFF WATER LOW IN ALKALINITY. A POND OR LAKE LOW IN ALKALINITY TENDS TO BE LOW IN POUNDS OF FISH PER SURFACE ACRE. SUCH WATER IS SUBJECT TO GREATER CHANGES IN pH, AND IF SEVERE, CAN CAUSE STRESSES ON FISH.

FIGURE 3

GENERAL SOIL MAP



See Legend on Next Page

Adapted from, Soils of Illinois,
Bulletin 725, University of Illinois
College of Agriculture, Urbana, Illinois, 1967

WILLIAMSON COUNTY

SOIL MAP LEGEND

F. Hoyleton-Cisne-Huey Soil Association: Developed primarily from loess. Occur on nearly level to moderately sloping uplands. Moderately well-drained to poorly drained. Erosion control is needed on the more sloping areas and drainage is needed on the nearly level areas.

P. Hosmer-Stoy-Weir Soil Association: Light colored, strongly developed soils formed under forest vegetation; occur on nearly level to very strongly sloping uplands; fertility and erosion are main problems.

Q. Ava-Bluford-Wynoose Soil Association: Light colored, strongly to very strongly developed soils formed under forest vegetation; soils are imperfectly moderately and well-drained, depending on type. Fertility, erosion control, and drainage are the major problems.

R. Grantsburg-Robbs-Wellston Soil Association: Developed primarily from loess. Occur on gently sloping to very steep topography. Fertility and erosion control are the main problems.

W. Littleton-Proctor-Plano-Camden-Hurst-Ginat Soil Association: Developed primarily from medium and fine textured outwash. Occur over a wide range of slope—from nearly level to very steep—on upland and stream terrace areas. Problems encountered are drainage, erosion, and fertility, depending upon the soil group.

ALPHABETICAL LISTING AND DESCRIPTION OF MAJOR LAKES AND STREAMS

LAKES

ONLY LAKES CONTAINING 6.0 OR MORE SURFACE ACRES ARE LISTED INDIVIDUALLY. INFORMATION PRESENTED INCLUDES LOCATION, CLASSIFICATION OF OWNERSHIP, SURFACE ACRES, APPROXIMATE MAXIMUM DEPTH, SHORELINE LENGTH, TYPE OF LAKE, YEAR BUILT, AND COMMENTS ON THE FISH POPULATION. NUMBERS IN PARENTHESES REFER TO MAP LOCATIONS (FIG. 4). THE DISTRIBUTION OF PONDS BY TOWNSHIPS (PERCENT OF TOTAL NUMBER) IS PRESENTED IN FIGURE 5.

CARTERVILLE RESERVOIR (1); T9S, R1E, SECTION 1; PUBLIC; SURFACE ACRES = 49.1; MAXIMUM DEPTH = 20.0 FEET; CONSTRUCTED = 1924.

CARTERVILLE RESERVOIR IS LOCATED APPROXIMATELY 3 MILES SOUTH OF HERRIN AND JUST TO THE WEST OF ILLINOIS ROUTE 148. MANAGEMENT WORK RELATED TO THE LAKE'S FISHERY WAS INITIATED IN 1954, AND IT WAS DURING THIS SAME YEAR THAT THE LAKE SHRANK TO A MERE 15 SURFACE ACRES OR THEREABOUTS IN SIZE AND HAD AN AVERAGE DEPTH OF ONLY 2.5 FEET. REASONS FOR THE DRASTIC REDUCTION IN THE SIZE OF THE LAKE ARE NOT GIVEN, AND SO ONE HAS TO SURMISE THAT EITHER A LEAKAGE PROBLEM AROSE OR THAT THE SOUTHERN PART OF THE STATE HAD A VERY HOT AND DRY SUMMER THAT YEAR.

FISH POPULATION SURVEYS OVER THE YEARS HAVE POINTED UP THE NEED FOR COMPLETE REHABILITATION AS A MEANS OF RESTORING BOTH BALANCE AND DESIRABILITY TO THE SPECIES STRUCTURE OF THE LAKE. AS IT IS, BOTH THE BASS AND THE SMALLER VARIETIES OF SUNFISHES, ESPECIALLY THE BLUEGILL, HAVE HAD A TENDENCY TO OVERPOPULATE, BECOMING NUMERICALLY TOO ABUNDANT TO BE ACCOMMODATED BY THE NATURAL FEEDING GROUNDS AVAILABLE. THE IDEA OF REHABILITATION HAS NEVER BEEN TOO WELL RECEIVED, BECAUSE IN ORDER FOR IT TO BE PROPERLY COMPLETED, THE OLD HERRIN RESERVOIR, WHICH LIES IN THE SAME WATERSHED AND IMMEDIATELY ABOVE CARTERVILLE LAKE, WOULD HAVE TO BE SIMULTANEOUSLY REHABILITATED. THIS WOULD HAVE TO BE DONE IN ORDER TO ASSURE SATISFACTORY LONG TERM RESULTS TO THE LOWER LAKE. OTHERWISE, IT WOULD BE CONSTANTLY SUBJECT TO REINTRODUCTION OF UNDESIRABLE SPECIES. ANNUAL DRAWDOWNS IN WHICH THE NORMAL SURFACE AREA OF THE LAKE IS DIMINISHED AT LEAST BY 50 PERCENT MIGHT ALSO HELP, BUT BEING A CITY WATER SUPPLY, IT IS HIGHLY IMPROBABLE THAT SUCH A RECOMMENDATION WILL EVER BE EMPLOYED.

BESIDES BASS AND BLUEGILL, THE CARTERVILLE LAKE IS KNOWN TO CONTAIN YELLOW PERCH, BLACK CRAPPIE, GRASS PICKEREL, WARMOUTH, BUFFALO SPP., HYBRID SUNFISH, AND GREEN SUNFISH.

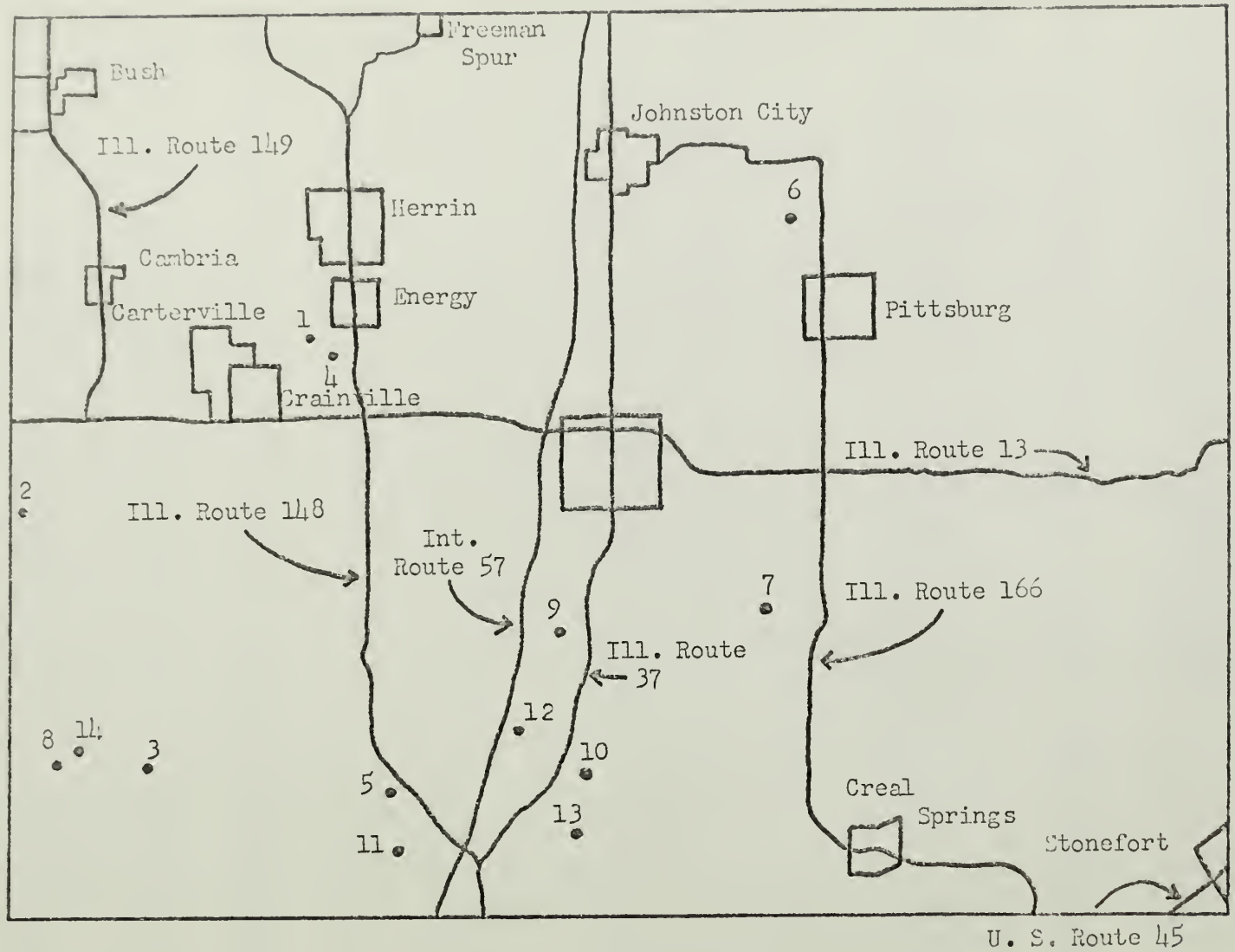
CRAB ORCHARD LAKE (2); T9S, R1E, SECTION 19; PUBLIC; SURFACE ACRES = 6,910; MAXIMUM DEPTH = 25.0 FEET; SHORELINE LENGTH = 125.0 MILES; CONSTRUCTED = 1941.

CRAB ORCHARD LAKE IS THE LARGEST OF THE THREE PUBLIC LAKES WHICH ARE INCLUDED AS A PART OF THE 43,000 ACRE CRAB ORCHARD NATIONAL WILDLIFE REFUGE; THE OTHER TWO LAKES BEING LITTLE GRASSY AND DEVIL'S KITCHEN. AS A MAJOR PART OF THE REFUGE COMPLEX, THE LAKE HAS BEEN SPECIFICALLY DESIGNED TO SERVE THE GENERAL PUBLIC AND ALL OF THE NEIGHBORING COMMUNITIES IN A VARIETY OF WAYS, NOT THE LEAST OF WHICH IS AS A RECREATIONAL AREA. FISHING, HUNTING, SWIMMING, CAMPING, PICNICKING, AND PLEASURE BOATING ARE THE PRIMARY RECREATIONAL ACTIVITIES THAT OCCUR WITHIN THE REFUGE BOUNDARIES.

AS A PART OF ITS MULTI-USE DESIGN, A LARGE PORTION OF THE REFUGE HAS BEEN SET ASIDE FOR PROTECTION OF WILDLIFE AND WATERFOWL AS WELL AS FOR SOIL AND WATER CONSERVATION PRACTICES. PUBLIC ACCESSIBILITY TO CERTAIN PORTIONS OF CRAB ORCHARD LAKE IS STRICTLY LIMITED DURING THE WATERFOWL SEASON. THOUSANDS OF GEESE AND DUCKS ANNUALLY

FIGURE 4

LOCATIONS OF LAKES



Numbers representing lakes correspond to those in text.

FIGURE 5

DISTRIBUTION OF PONDS BY TOWNSHIPS

	R1E	R2E	R3E	R4E	
T8S	7.7%	11.1%	8.0%	9.4%	T8S
T9S	4.8%	7.3%	9.9%	12.3%	T9S
T10S	4.3%	7.6%	10.6%	6.4%	T10S
	R1E	R2E	R3E	R4E	

USE THE RESTRICTED PARTS OF THE REFUGE AS LOAFING AREAS ON THEIR SOUTHERLY MIGRATION. IN FACT, A LARGE PERCENTAGE OF THE BIRDS SPEND THEIR ENTIRE WINTER HERE, AWAITING THE SPRING THAWS SO THAT THEY CAN RETURN TO THEIR SUMMER NESTING AREAS FURTHER NORTH.

FARMLANDS, LAKES, AND POTHOLES ADJACENT TO THE REFUGE, AND EVEN PORTIONS OF THE REFUGE ITSELF, OFFER SOME OF THE BEST WATERFOWL HUNTING OPPORTUNITIES TO BE FOUND IN THE STATE.

CRAB ORCHARD LAKE IS ALSO USED AS A SOURCE FOR INDUSTRIAL AND MUNICIPAL WATER SUPPLY. AREAS WITHIN THE COMPLEX WHICH ONCE SERVED AS FACILITIES FOR ORDINANCE PRODUCTION AND SUPPLY DURING WORLD WAR II ARE TODAY USED BY NUMEROUS INDUSTRIES. THESE INDUSTRIES PROVIDE STEADY EMPLOYMENT FOR SEVERAL HUNDRED PERSONS FROM NEARBY COMMUNITIES.

FEDERAL AND STATE FISH BIOLOGISTS JOINTLY CONDUCTED AN EXTENSIVE SURVEY OF THE LAKE'S FISH POPULATION DURING THE FALL OF 1971. THIS SURVEY DISCLOSED THE FACT THAT, STATEWIDE, CRAB ORCHARD LAKE IS VERY PROBABLY ONE OF THE BEST, IF NOT THE BEST, LAKE TO GO IN SEARCH OF A BRAGGING SIZE BASS. EMBAYMENT SAMPLING WITH ROTENONE AS WELL AS COLLECTIONS THAT WERE MADE BY MEANS OF ELECTRO-GEAR REVEALED THE PRESENCE OF NUMEROUS FISH IN THE 6 TO 9 POUND CATEGORY. LARGER FISH ARE UNDOUBTEDLY PRESENT. JUST AS IMPORTANTLY, EVIDENCE OF REPRODUCTIVE SUCCESS FOR THE PAST FEW YEARS WAS OBTAINED.

THE LAKE CONTAINS A LARGE POUNDAGE OF GIZZARD SHAD, AND THIS PROBABLY ACCOUNTS IN PART FOR THE DIFFICULTY WITH WHICH MANY OF THE LARGER BASS ARE TAKEN. THE GIZZARD SHAD GROWS RATHER RAPIDLY AND THUS QUICKLY ATTAINS A SIZE TOO LARGE FOR PREDATION BY ALL BUT THE LARGEST BASS.

WHITE BASS WERE INTRODUCED TO THE LAKE IN 1960. THE YOUNG OF THIS SPECIES SHOWED UP ENOUGH TIMES IN THE 1971 FALL SAMPLING TO INDICATE THAT REPRODUCTION AND SURVIVAL HAVE BEEN OCCURRING SUCCESSFULLY, AND THAT THIS FISH WILL CONTINUE TO ADD VARIETY TO THE SPORT FISHERMAN'S CREEL. AS OF THIS WRITING THE RECORD WHITE BASS FOR THE STATE (4 LB. 1 OZ.) COMES FROM CRAB ORCHARD LAKE. IT WAS TAKEN IN 1970.

BLUEGILL, CRAPPIE (BOTH BLACK AND WHITE), AND CHANNEL CATFISH ARE FOUR MORE OF THE GAME FISH WHICH STIMULATE MUCH ATTENTION FROM ANGLERS AT CRAB ORCHARD. EACH WAS WELL REPRESENTED EITHER AS A RESULT OF THE ROTENONE OR ELECTRO-SAMPLING OPERATION THAT WERE CONDUCTED. BLUEGILL IN THE 6 TO 8 INCH SIZE RANGE, CRAPPIE WEIGHING FROM $\frac{1}{2}$ TO 3/4 OF A POUND, AND CHANNEL CATFISH RANGING IN SIZE FROM 6 TO 10 POUNDS WERE EITHER ENCOUNTERED DIRECTLY OR WERE REPORTED BY ANGLERS WITH ENOUGH FREQUENCY THAT THEY CAN BE ASSUMED TO BE REASONABLY ABUNDANT.

SEVERAL THOUSAND NORTHERN PIKE WERE STOCKED AS FRY AND WERE RAISED IN SPECIAL NURSERY SLOUGHS AROUND THE LAKE. THESE WERE PERMITTED TO GROW TO A SIZE FROM 10 TO 20 INCHES PRIOR TO RELEASE INTO THE LAKE IN 1970 AND AGAIN IN 1971; THE HOPE BEING THAT THEY WOULD HELP TO EXERCISE SOME CONTROL OVER THE LARGE NUMBERS OF VARIOUS FORAGE FISHES WHICH THE LAKE CONTAINS. FUTURE PLANS CALL FOR FURTHER DEVELOPMENT AND REFINEMENT OF THIS MANAGEMENT APPROACH. ASIDE FROM THE BENEFITS WHICH THE NORTHERN MAY VERY WELL PROVIDE TO THE LAKE BECAUSE OF ITS PREDATORY NATURE, IT SHOULD ALSO PROVIDE AN ADDED "BONUS" TO THE ANGLER WHO HAPPENS TO BE JUST DUNKING MINNOWS FOR CRAPPIE OR DANGLING WORMS FOR BLUEGILLS OR CATFISH. SUPPLEMENTAL STOCKINGS OF LARGEMOUTH BASS WHICH HAVE BEEN ALLOWED TO GROW TO A NON-VULNERABLE SIZE IN SPECIAL REARING PONDS ON THE REFUGE GROUNDS WILL BE ATTEMPTED ALSO.

BESIDES THOSE SPECIES ALREADY MENTIONED, THE LAKE CONTAINS ORANGESPOTTED

SUNFISH, BULLHEADS, YELLOW BASS, CARP, BUFFALO, AND FRESHWATER DRUM.

SOME COMMERCIAL FISHING HAS BEEN ALLOWED ON THE LAKE IN YEARS PAST. APPARENTLY THESE OPERATIONS HAVE HAD LITTLE BENEFICIAL EFFECT AS FAR AS BRINGING ABOUT A REDUCTION IN THE TONNAGES OF ROUGH SCAVENGER TYPE FISH.

CRAB ORCHARD LAKE IS LARGE AND IT IS OLD, COMPARATIVELY SPEAKING. COMPLETE CHEMICAL REHABILITATION WOULD BE VERY COSTLY; ITS MULTIPURPOSE DESIGN WOULD NOT EASILY ALLOW SUCH AN UNDERTAKING. NONETHELESS, THIS WOULD BE THE QUICKEST AND SUREST WAY TO RESTORE A MORE EVEN BALANCE BETWEEN GAME AND ROUGH FISH.

OVER THE YEARS NUMEROUS SMALL PONDS AND LAKES HAVE BEEN CONSTRUCTED THROUGHOUT THE REFUGE GROUNDS. PUBLIC ACCESS TO THESE AREAS IS STRICTLY LIMITED, OR NOT ALLOWED AT ALL, AS THEY HAVE BEEN DESIGNED TO SERVE AS SECLUDED WATERING AND LOAFING POINTS FOR GAME AND WATERFOWL. SECONDARILY, MANY OF THESE PONDS AND SMALL LAKES CAN BE UTILIZED AS NURSERY AREAS FOR RAISING TO A NONSUSCEPTIBLE SIZE THOSE SPECIES OF FISH WHICH WILL GROW IN BUT WHICH HAVE TROUBLE REPRODUCING IN THE PHYSICAL SURROUNDINGS THAT CRAB ORCHARD LAKE HAS TO OFFER.

DEVIL'S KITCHEN LAKE (3); T10S, R1E, SECTION 16; PUBLIC; SURFACE ACRES = 810.0; MAXIMUM DEPTH = 90.0 FEET; SHORELINE LENGTH = 24.0 MILES; CONSTRUCTED = 1959.

DEVIL'S KITCHEN LAKE IS THE SMALLEST OF THE LARGE PUBLIC LAKES WHICH ARE INCLUDED AS A PART OF THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE COMPLEX. THE LAKE ITSELF IS LOCATED APPROXIMATELY 12 MILES SOUTHEAST OF CARBONDALE.

ALTHOUGH A FEDERALLY MANAGED BODY OF WATER AS FAR AS ITS FISHERY, STATE BIOLOGISTS HAVE ON OCCASIONS CONDUCTED STUDIES OF THEIR OWN. THESE STUDIES WERE MADE DURING THE LAKE'S EARLY HISTORY; A FISH POPULATION SURVEY BEING UNDERTAKEN IN 1961 AND RATHER EXTENSIVE OBSERVATIONS OF THE LAKE'S WATER CHEMISTRY BEING CARRIED OUT DURING 1962.

MORE EXTENSIVE INVESTIGATIONS AS TO FISH AND FISHING AT THE LAKE HAVE BEEN MADE BY PERSONNEL OF THE BUREAU OF SPORT FISHERIES. IN 1969 THEY CONDUCTED AN INTENSIVE CREEL CENSUS. THIS CENSUS SHOWED THAT ANGLERS CAUGHT AND KEPT MORE BLUEGILL THAN ANY OTHER SINGLE FISH. AFTER ALL CENSUSING HAD BEEN COMPLETED, IT WAS SHOWN THAT 74 PERCENT OF THE ANGLER'S HARVEST WAS MADE UP OF BLUEGILL AND THAT 14.4 PERCENT OF THE HARVEST CONSISTED OF LARGEMOUTH BASS. WARMOUTH, CRAPPIE, AND LONGEAR SUNFISH WERE, IN THIS ORDER, THE NEXT MOST FREQUENTLY CROPPED SPECIES.

THERE WERE A TOTAL OF 10 SPECIES OF FISH THAT WERE INCLUDED IN THE FISHERMAN'S CREEL. BESIDES THE 5 SPECIES ALREADY MENTIONED, YELLOW PERCH, REDEAR SUNFISH, BLACK BULLHEAD, GREEN SUNFISH AND YELLOW BULLHEADS WERE ALSO INCLUDED IN THE CENSUS. NO NONGAME OR ROUGH SPECIES WERE CREELED.

IN THE EVALUATIONS THAT WERE MADE FOLLOWING THE CREEL CENSUS, IT WAS NOTED THAT ALTHOUGH CHANNEL CATFISH AND SMALLMOUTH BASS HAD BEEN STOCKED AT DEVIL'S KITCHEN, NEITHER SPECIES SHOWED UP IN THE CREEL CENSUS. BOTH WERE STOCKED AS FINGERLINGS. APPARENTLY THERE WAS POOR SURVIVAL DUE TO COMPETITION FROM THE FISH THAT WERE ALREADY PRESENT AT THE TIME OF STOCKING.

WATER CHEMISTRY STUDIES WERE MADE BY THE FISH AND WILDLIFE SERVICE IN 1969 AS THEY HAD BEEN DONE BY THE STATE OF ILLINOIS IN 1962. THESE STUDIES WERE MADE TO DETERMINE THE FEASIBILITY OF DEVELOPING A TROUT OR A WALLEYE FISHERY. TEMPERATURE AND DISSOLVED OXYGEN READINGS WHICH WERE RECORDED AND ANALYZED INDICATED STRONGLY THAT A TROUT FISHERY WOULD NOT DO WELL AT ALL. THE ONLY THING WHICH MADE THE WALLEYE FISHERY LOOK DOUBTFUL WAS INSUFFICIENT FORAGE.

Along with the creel census conducted in the summer of 1969, the Bureau of Sport Fisheries also undertook fish population studies. From these studies, it is estimated that as far as numerical abundance, the white and black crappie lead. Bluegill, longear sunfish, warmouth, largemouth bass, bullheads (black and yellow), and yellow perch are believed to be progressively less abundant in the order listed. Spotted suckers, white suckers, and golden shiners are the 3 most frequently encountered nongame species.

A fisherman at Devil's Kitchen might expect to land pumpkinseed, grass pickerel, rock bass and channel catfish in addition to the species of fish already discussed.

Hard-surfaced roads make Devil's Kitchen Lake easily accessible to the general public. A number of launching ramps and other facilities are available as well. Its general setting among the hardwoods and sandstone bluffs typical of Southern Illinois makes it one of the most attractive lakes in the state.

Herrin Reservoir #1 (4); T9S, R2E, Section 6; Public; Surface Acres = 51.3; Maximum Depth = 13.5 feet; Constructed = 1910.

This lake, a part of Herrin's water supply system, is located about one-half mile southwest of Energy. For the past 25 to 30 years it has received management attention in various forms. A large stocking of mixed species of fish is the first recorded involvement by state biologists, and that came about in 1941. During the ensuing years different surveys and analyses of the lake and its fish population have been made. On at least one occasion some of the fish that were collected were sent to Springfield for display at the state fair.

Most management principles have been precluded from use here at the city lake. Those in charge never considered it feasible to employ the use of rotenone to selectively remove undesirable fish or to reduce the water level in the lake as a means of confining prey with predator fish. Complete rehabilitation may someday be used to restore a more desirable species structure and balance to the lake. As it is, killing it out completely and restocking it would be the surest way to bring back good fishing.

Water has in the past been pumped in from Crab Orchard Lake as a means of maintaining an adequate water level through droughty spells. This would have to be discontinued in order for a rehabilitation project to be successful. It has also been recommended that Carterville Reservoir, the upper end of which butts up against the dam that forms Herrin Reservoir #1, be simultaneously rehabilitated for best all around results.

Latest records of its fish population show the lake to contain bluegill, crappie, bullheads, warmouth, largemouth bass, green sunfish, yellow perch, grass pickerel, and channel catfish.

Herrin Reservoir #2 (5); T10S, R2E, Section 20; Public; Surface Acres = 46.1; Maximum Depth = 17.0 feet; Constructed = 1926.

This lake, also known as the Herrin New Reservoir, is located approximately 3 miles southwest of Marion. It sits in a very heavily timbered area and parts of it are surrounded by sandstone bluffs. The setting is scenically tasteful. File records indicate, however, that the lake itself is subject to extremely turbid conditions from time to time due to erosion from the watershed. As with the city's older reservoir, this lake has had management attention on various occasions; and like the other reservoir too, biologists have been limited as to what they could feasibly recommend. Chemical eradication of the entire fish population in this lake

AND A FOLLOW-UP STOCKING WITH ADEQUATE NUMBERS OF DESIRABLE GAME FISH WOULD BE THE QUICKEST AND MOST PRACTICAL MEANS AVAILABLE TOWARDS RESTORING GOOD FISHING. THE LAST TIME THAT THE LAKE WAS SAMPLED BY STATE BIOLOGISTS, ITS FISH POPULATION CONSISTED OF GREEN AND LONGEAR SUNFISH, BLUEGILL, BLACK CRAPPIE, AND LARGEMOUTH BASS.

JOHNSTON CITY RESERVOIR (6); T8S, R3E, SECTION 27; PUBLIC; SURFACE ACRES = 59.2; MAXIMUM DEPTH = 11.0 FEET; CONSTRUCTED = 1922.

LOCATED ABOUT 3 MILES SOUTHEAST OF JOHNSTON CITY, THIS RESERVOIR LIES IN THE NORTH-CENTRAL PART OF THE COUNTY. THE LAKE'S FISH POPULATION, SAMPLED BY STATE BIOLOGISTS ON DIFFERENT OCCASIONS, CONSISTS OF GREEN SUNFISH, BLUEGILL, WARMOUTH, CRAPPIE, GRASS PICKEREL, AND LARGEMOUTH BASS. WATER IS USED FROM THE LAKE DOMESTICALLY, AND CONSEQUENTLY, LITTLE IN THE WAY OF FISHERIES MANAGEMENT HAS EVER BEEN CARRIED OUT. THE POTENTIAL FOR CREATION OF A MORE DESIRABLE FISHERY IS PRESENT.

K.P. CLUB LAKE (7); T9S, R3E, SECTION 33; CLUB; SURFACE ACRES = 10.3; MAXIMUM DEPTH = 18.0 FEET; CONSTRUCTED = 1923.

THE K. P. CLUB LAKE, OWNED AND OPERATED BY MEMBERS OF A FRATERNAL ORGANIZATION KNOWN AS THE KNIGHTS OF PITHIUS, IS SITUATED MORE OR LESS CENTRALLY WITHIN THE COUNTY; LYING ABOUT 3 OR 4 MILES TO THE SOUTHEAST OF MARION. A HISTORY OF REQUESTS CONCERNED WITH LAKE MANAGEMENT GUIDANCE DATES AS FAR BACK AS 1953. DURING THE COURSE OF THAT FIRST YEAR THERE OCCURRED A SIGNIFICANT DIE-OFF OF FISH; THE CAUSE OF WHICH WAS NEVER POSITIVELY IDENTIFIABLE. IT APPEARED LIKELY THAT EITHER ACID MINE WASTES OR ROAD SURFACING MATERIALS HAD POSSIBLY WASHED IN FROM THE UPPER PART OF THE LAKE'S WATERSHED.

THE LAKE RECEIVED A STOCKING OF 25 BREEDER-SIZE BASS FROM THE STATE IN 1955. IN 1960, THE CLUB MEMBERSHIP BECAME INTERESTED IN ENLARGING THE SURFACE ACREAGE AND STORAGE VOLUME OF ITS LAKE; PLANS WERE DRAWN UP AND ULTIMATELY THE EXISTING SPILLWAY WAS ELEVATED SEVERAL FEET.

BECAUSE OF THE CLARITY OF THE WATER WHICH THE BASIN MAINTAINS, THE LAKE HAS HAD AN ONGOING PROBLEM WITH AQUATIC VEGETATION. COONTAIL IS PERHAPS THE DOMINANT PLANT, AND IT IS ESPECIALLY BOTHERSOME TO ANGLERS AS WELL AS TO SWIMMERS. ALL OF THE SHALLOWER AREAS BECOME COMPLETELY CLOGGED WITH THIS MATERIAL WHICH TAKES ON THE APPEARANCE OF A VAST UNDERWATER FOREST OF PINE TREES. ANGLING IS IMPOSSIBLE IN ALL BUT A FEW SELECTED SPOTS.

IN THE EARLY FALL OF 1972 THE MEMBERSHIP TOOK MEASURES TO TRY AND CORRECT THE SITUATION THAT EXISTED BY DRAINING THE LAKE LEVEL DOWN TO A POINT WHERE THE WEEDS WOULD BE EXPOSED TO DRYING THROUGH THE LATE FALL AND TO FREEZING OVER THE COURSE OF THE WINTER. IN ADDITION, THEY HOPED TO TEST THE POTENCY OF A TERRESTRIAL HERBICIDE AGAINST THE VEGETATION WHICH WOULD, AS A CONSEQUENCE OF THE DRAINING, BE DISPLACED FROM ITS ACCUSTOMED HABITAT. BY DROPPING THE WATER LEVEL, THERE IS THE POSSIBILITY THAT THEY BENEFITED THE FISH POPULATION AS WELL. THE BASS, CRAPPIE, AND LARGER CHANNEL CATFISH, ALL PREDATORS, WOULD HAVE BEEN ABLE TO LOCATE AND MORE EASILY CATCH THEIR PREY.

ASIDE FROM THE COONTAIL ALREADY DISCUSSED, THE LAKE ALSO CONTAINS SEVERAL FAIRLY LARGE PATCHES OF SPATTERDOCK AND WATER LILIES.

IN ADDITION TO LARGEMOUTH BASS, CRAPPIE, AND CHANNEL CATFISH THE LAKE HAS BLUEGILL, BULLHEADS, AND REDEAR SUNFISH.

THE LAKE IS ENCIRCLED BY PRIVATE CABINS AND COTTAGES. USE OF THE AREA IS LIMITED TO MEMBERS AND SPECIAL GUESTS ONLY.

Little Grassy Lake (8); T10S, R1E, Section 18; Public; Surface Acres = 1,000; Maximum Depth = 77.0 feet; Shoreline Length = 28.3 miles; Constructed = 1950.

Little Grassy Lake is to be found in the southwestern corner of the county, 10 miles or so southeast of Carbondale. Small portions of the lake extend west across the county line into Jackson County. The impoundment lies scenically nestled within a somewhat heavily timbered area, much similar to Devil's Kitchen Lake, and occupies a position along the northern fringes of both what has been arbitrarily designated as boundary to Shawnee National Forest property and what is generally recognized as the beginnings of the so-called "Illinois Ozarks". It is conveniently reached by vehicle from a number of different directions. Good all-weather secondary roads lead into and out of the area. The lake itself is exceptionally clean and clea looking. Rock outcroppings that appear here and there along the shoreline add to the overall attractiveness of the whole setting. Approximately 1/3 of the 9,660 acre watershed falls under the administrative jurisdiction of the U. S. Department of the Interior. The remaining 65-70% is privately owned. Field personnel from the Bureau of Sport Fisheries and Wildlife manage the lake's fish population.

Annually, the lake offers some of the better crappie fishing in the southern part of the state. In fact, the former state record for black crappie was for years a specimen of about 4 pounds which came from Little Grassy Lake. Largemouth bass ranging in size from 4 to 7 pounds are likewise present and are taken with a fair amount of frequency.

Fish sampling data gathered by biologists from the Fish and Wildlife Service in 1970 showed that the white crappie was at that time the most abundant species present. Largemouth bass ranked 5th in abundance behind bluegill, gizzard shad, and longear sunfish in that order.

In creeling anglers who used the lake during 1970, biologists from the Bureau of Sport Fisheries were also able to conclude that the crappie comprised both by weight and by number the major part of the angler's harvest. Largemouth bass and bluegill respectively were the next two most frequently harvested fish.

The lake has a concession area plus several good boat launching sites. Boat fishing with outboards is permitted and rental boats are available. Facilities are also available for swimming, camping, and picnicking.

Besides the species already discussed, fishermen might also expect to encounter an occasional green sunfish, carp, bullhead, white sucker, golden shiner, spotted sucker, brooksilverside, or grass pickerel.

Marion City Lake (9); T10S, R2E, Section 2; Public; Surface Acres = 220.0; Maximum Depth = 18.0 feet; Shoreline Length = 2.4 miles; Constructed = 1920 (1971).

This is a city water supply lake located about 3 miles south of Marion. Recreational opportunities which for the most part consist of fishing, skiing, swimming, boating, and some waterfowl hunting are necessarily of secondary importance to the domestic water needs of Marion's residents.

The lake offers a variety of fish species to the angler. Among the different types of fish known to be present are bluegill, bullheads, largemouth bass, longear and green sunfish, yellow bass, warmouth, crappie, and channel catfish.

Fish population samples in the past have demonstrated a general trend towards slow growing fish and have illustrated the need to thin out over-abundant small sunfishes. The tendency of many fish populations toward stunting is a common

PROBLEM CAUSED BY THE SURVIVAL OF TOO MANY YOUNG FISH. IN SUCH A SITUATION THERE ARE NOT ENOUGH NATURALLY OCCURRING FOOD ORGANISMS TO ALLOW DESIRABLE GROWTH. WITH PROPER MANAGEMENT THE NUMBERS OF FISH CAN BE REDUCED TO BRING THEM INTO BETTER BALANCE WITH THE FOOD SUPPLY.

LOTUS, COONTAIL, CATTAILS, AND SAGO PONDWEED HAVE BEEN THE PRINCIPAL WEEDS OCCURRING THROUGHOUT THE AQUATIC ENVIRONMENT. GROWTH OF LOTUS HAS IN THE PAST BEEN A PROBLEM IN CERTAIN PORTIONS OF THE LAKE. THE DENSER AREAS OF GROWTH ACT AS SANCTUARY TO A LOT OF THE SMALLER FISH, THUS ALLOWING THEM TO BECOME TOO NUMEROUS FOR THEIR OWN GOOD OR FOR THE OVERALL GOOD OF THE LAKE'S FISH POPULATION.

IN 1970 AND THROUGH 1971 A RESTRUCTURING OF THE DAM AND SPILLWAY WAS UNDERTAKEN. MOST OF THE NECESSARY RENOVATIONS WERE COMPLETE BY SEPTEMBER OF 1971. ENGINEERS ESTIMATED THAT THE REDESIGN IN THE DAM STRUCTURE WOULD BRING THE SURFACE ACREAGE FROM 213.0 TO ABOUT 220.0, AND THAT THE MAXIMUM AND AVERAGE DEPTHS WOULD INCREASE CORRESPONDINGLY, THE NEW MAXIMUM BEING 23 TO 24 FEET.

MARION COUNTRY CLUB LAKE (10); T10S, R2E, SECTION 13; CLUB; SURFACE ACRES = 49.0; MAXIMUM DEPTH = 20.0 FEET; CONSTRUCTED = 1914.

THIS LAKE HAS A LONG HISTORY OF HEAVY AND USUALLY SUCCESSFUL ANGLER USAGE. IF NOT ONE OF THE STATE'S BEST BLUEGILL LAKES, THEN IT WOULD AT LEAST HAVE TO BE CONSIDERED ONE OF SOUTHERN ILLINOIS' FINEST. GROWTH RATES OF SAMPLE BLUEGILL COLLECTED AND ANALYZED BY INSPECTING STATE BIOLOGISTS HAVE REPEATEDLY EXCEEDED STATEWIDE AVERAGES. IT HAS ALSO PROVIDED SOME VERY GOOD FISHING FOR LARGEMOUTH BASS AND REDEAR SUNFISH.

WEEDS, PARTICULARLY COONTAIL AND RECENTLY SOUTHERN NAIAD, HAVE ALWAYS BEEN A NUISANCE. VARIOUS ATTEMPTS AT REMOVING THEM HAVE BEEN MADE, RANGING ALL THE WAY FROM HEAVY APPLICATIONS OF COPPER SULFATE TO THE USE OF HAND RAKES. NONE OF THE ATTEMPTS TO DATE HAS BEEN SUCCESSFUL OR LONG-LASTING. AT ONE TIME IT WAS SUGGESTED THAT AN INORGANIC TYPE CHEMICAL FERTILIZER BE USED TO PROMOTE THE DEVELOPMENT OF A PLANKTON "BLOOM"; ONE WHOSE DENSITY WOULD BE SUFFICIENT ENOUGH TO MARKEDLY AFFECT THE DEGREE OF SUNLIGHT PNENTRATION THROUGHOUT THE ENTIRE LAKE. SHADING THE LAKE BOTTOM IN THIS WAY WOULD THEREBY LIMIT THE EXTENT OF SPACE AVAILABLE CONDUCIVE TO GROWTH BY MANY AQUATIC WEEDS.

THE LAKE IS LOCATED SOUTH OF MARION ABOUT 6 MILES. LARGEMOUTH BASS, BLUEGILL, WARMOUTH, CRAPPIE, CARP, BULLHEADS, AND LONGEAR, GREEN, AND REDEAR SUNFISH HAVE ON DIFFERENT OCCASIONS BEEN SAMPLED FROM THE LAKE. USE OF THE LAKE IS LIMITED TO THE MEMBERSHIP ONLY.

PLEASANT VALLEY CLUB LAKE (11); T10S, R2E, SECTION 29; ORGANIZATION; SURFACE ACRES = 9.6; MAXIMUM DEPTH = 25.0 FEET; CONSTRUCTED = 1958.

LOCATED SOUTH-CENTRALLY WITHIN THE COUNTY, THIS SMALL CLUB LAKE RECEIVED ITS ORIGINAL STOCKING OF FISH IN 1958. BREEDER BASS AND BLUEGILL WERE PROVIDED BY THE STATE. WITHIN 4 YEARS TIME THE FISH HAD OVERPOPULATED THEMSELVES AND AS A CONSEQUENCE WERE SUFFERING FROM A LACK OF SIZE. THE LARGEST BASS COLLECTED IN A FISH POPULATION ANALYSIS AT THAT TIME WERE ONLY 10 INCHES LONG. BLUEGILL AND GREEN SUNFISH WERE ALSO SMALL. ANNUAL DRAWDOWNS WERE RECOMMENDED AS A SUITABLE MEANS TOWARDS REMEDYING THE SITUATION. WITH THE WATERLEVEL DOWN, SMALL FISHES WOULD BE MORE VULNERABLE TO PREDATION BY LARGEMOUTH BASS. BY EMPLOYING THIS TECHNIQUE THE ENTIRE POPULATION OF FISH COULD GRADUALLY BE BROUGHT BACK INTO PROPER BALANCE, AND INDIVIDUAL FISH WOULD ATTAIN A BETTER AVERAGE SIZE AND CONDITION.

LAKE SURVEY RECORDS INDICATE THAT AQUATIC WEED GROWTHS HAVE BEEN A PROBLEM AT

Pleasant Valley Lake in the past. Chara, an advanced type of algae, has been the primary problem.

Teal Lake (12); T10S, R2E, Section 15; Organization; Surface Acres = 28.9; Maximum Depth = 15.0 feet; Constructed = 1957.

The state originally stocked this lake in 1957 with largemouth bass and bluegill. In 1963 the members added channel catfish and redear sunfish. Records indicate that the lake has never had an outstanding fish population. Bass fishing has been good from time to time, but small undersized bluegill, crappie, and bullheads are overly numerous.

Certain aquatic plants, primarily coontail and filamentous algae, have posed a problem to management of the lake. Coontail was removed with chemical treatment in the 1960's. Regrowth occurs with this method, however, and annual treatments must be made to achieve results. Lotus and cattails too have made sporadic appearances.

Teal Lake is located approximately 7 miles south of Marion.

Lake of Egypt (13); T10S, R2E, Sections 25 & 26; Private; Surface Acres = 965.0 (Williamson County portion); Maximum Depth = 52.0 feet; Shoreline Length = 93.0 miles Constructed = 1961.

Lake of Egypt is an R.E.A. financed impoundment owned by the Southern Illinois Power Cooperative. The basic purpose of the lake is to provide cooling water for the electrical energy generating plant. Attendant with the basic purpose has been the use of the lake for water oriented recreation and the construction of numerous cottages and homes along much of the shoreline.

Advanced fry largemouth bass were stocked in 1962 to supplement the 1962 year class of bass produced by native fishes present when the stream was impounded. In September 1965, channel catfish were stocked. Channel cat, as a result of reproduction, are not expected to survive due to predation by largemouth bass on catfish fry.

The sport fishery is made up primarily of largemouth bass, black and white crappie, and bluegill and is dependent on these species. Anglers can now expect to catch bass in the 8 to 9 pound class. Warmouth, green sunfish, black and yellow bullheads, longear sunfish, and carp are also present, but do not contribute significantly to the sport fishery. Additional species found in the lake consist of grass pickerel, spotted suckers, gizzard shad, and golden shiners. Threadfin shad, a forage type fish which feeds directly on plankton matter and which in turn bridges an important gap in the lake's food chain, were introduced in 1971.

In addition to fishing, the lake attracts pleasure boaters, water-skiers, swimmers, and campers. There are two privately owned marinas and campgrounds on the east side of the lake near the dam. Facilities include boats and motors for rent, tackle, concession stands, camping sites with electrical hookups, picnic tables, rest room facilities and swimming. The U. S. Forest Service has a public camping ground and boat launching ramp in the upper end of the lake on Wagon Creek Neck a few miles northwest of Tunnel Hill (Johnson County) or southwest of Creal Springs (Williamson County).

One of the problems at Lake of Egypt has been the encroachment of underwater vegetation; the problem plant being water milfoil (Myriophyllum spp.). Since lake water is used for domestic purposes by many of the people living around the lake, chemical control of the vegetation has not been approved by the State Department

of Public Health. There is a possibility that the problem will disappear as the lake ages due to ecological changes in the fish population and changes in the fertility of the water.

Little Grassy State Fish Hatchery (14); T10S, R1E, Section 17; Public; Surface Acres = 21.6; Constructed = 1956.

The Illinois Department of Conservation owns a 110 acre tract of land in the southeastern portion of the county, just below and to the north of Little Grassy Lake. It is here that one of the two existing state fish hatcheries is located. Eighteen ponds ranging in size from 0.33 to 2.73 acres are utilized as fish rearing areas for fingerling bluegill, largemouth bass, and redear sunfish; the 3 principal species provided for stocking of waters in Illinois.

Average annual production figures for each species are as follows: bluegill - 500,000; largemouth bass - 250,000; and redear sunfish - 150,000. In addition, some 200,000 fingerling goldfish and carp are also raised as a means of providing suitable forage for the adult breeder bass. Some production of channel catfish and smallmouth bass occurs as well, but this is at present only on a minor scale.

The hatchery grounds are open to public visitation on a daily basis. Guided tours are available by appointment. Perhaps from the visitor's viewpoint, the best times of year to observe the facilities are in June and October when the fish are being collected from the ponds, sorted, and readied for stocking deliveries.

Source of water for the hatchery is from Little Grassy Lake located several hundred yeards to the south and at a higher elevation; gravity then provides a constant and steady flow.

Streams

Major streams are described by name, location of stream mouth, area, length, and gradient. Additional information is included where applicable. A summary is given in Table 2. Number in parentheses refers to stream location shown in Figure 6.

Big Muddy River (1); T8S, R1E, Section 19; Surface Acres = 161.0; Miles in County = 21.0; Average Width = 63.3 feet; Gradient = Approximately 0.9 ft./mile.

The Big Muddy River is approximately 122 miles long from its point of origin to its juncture with the Mississippi River. It originates in Jefferson County, and along its course it drains about 2,400 square miles of land in 7 counties.

Portions of the river were included as part of a river basin study made by the Illinois Division of Fisheries in 1964 (Lopinot, 1965). Although none of the studies were made at points in Williamson County, the fish population was sampled upstream in Franklin County and downstream in Jackson County. At those stations forage fish such as minnows and darters made up 60 percent by number and 10 percent by weight of the fishes sampled; commercial species such as carp, buffalo, gar and suckers accounted for 3 percent by number and 47 percent by weight; and game fish such as the various species of sunfish, largemouth bass, and catfishes made up 37 percent by number and 43 percent by weight.

The Big Muddy receives pollutional discharges along its course from coal mining areas, oil field operations and siltation.

Sport fishing pressure is light to moderate, depending upon the area of the river. In Williamson County, pressure is light but it increases downstream in Jackson County, particularly at the mouth where it joins the Mississippi.

Commercial fishing is also greater in the lower reaches and near the mouth. Carp, buffalo and carpsuckers make up the bulk of the catch. They are taken primarily with hoop nets.

TABLE 2

MAJOR STREAMS IN WILLIAMSON COUNTY

Name	Average Width (Feet)	Total Length in County (Miles)	Approximate Surface Area (Acres)
Big Muddy River	63.3	21.0	161.0
Crab Orchard Creek	22.5	13.2	36.0
South Fork Saline River	18.3	26.0	57.6
Sugar Creek	18.3	7.8	12.6
TOTAL		68.0	267.2

Crab Orchard Creek (2); T9S, R1E, Section 19; Surface Acres = 36.0; Miles in County = 13.2; Average Width = 22.5 feet; Gradient = Approximately 4.5 ft./mile.

In 1964 Crab Orchard Creek was included as part of a statewide river basin study carried out by the Illinois Division of Fisheries (Lopinot, 1965). A pH test taken at the sampling station near Marion had a value of 3.0; no evidence of a fish population could be found. The upper portion of the creek drains an area of approximately 82.2 square miles, all of which is located within Williamson County. About 2,500 acres of land within the watershed have been strip-mined for coal. Runoff from these areas is largely responsible for the acidic water quality in the creek.

In 1941 the creek was dammed at its westernmost extremity in the county forming Crab Orchard Lake.

South Fork Saline River (3); T10S, R4E, Section 13; Surface Acres = 57.6; Miles in County = 26.0; Average Width = 18.3 feet; Gradient = Approximately 2.3 ft./mile.

This stream was investigated in 1963 as part of an inventory of fishes in four major river basins in Illinois (Lopinot, 1964). Three stations were established on the South Fork, one being in Williamson County near New Dennison and the others in Saline County. The Williamson County station was the only one in which the water was suitable for fish life; downstream the water is affected by acid mine wastes. Results of the survey were as follows: 63 percent of the fish by number were forage species (minnows and darters); 33 percent were game fish (sunfish, largemouth bass and crappie) and 4 percent were commercial (carp and suckers). By weight, 53 percent of the fish collected were commercial, while game and forage fish were 40 percent and 7 percent respectively.

FISHERMAN USAGE ON THIS, THE UPPER PORTION OF THE STREAM, IS BEST CLASSIFIED AS MODERATE. ANGLERS CATCH SUNFISH, CARP, AND BULLHEADS AT CERTAIN PERIODS IN THE YEAR.

SUGAR CREEK (4); T10S, R4E, SECTION 10; SURFACE ACRES = 12.6; MILES IN COUNTY = 7.8; AVERAGE WIDTH = 18.3 FEET; GRADIENT = APPROXIMATELY 1.7 FT./MILE.

SUGAR CREEK IS A RELATIVELY SMALL STREAM THAT DOES A GREAT DEAL OF WINDING AND BENDING BACK AND FORTH UPON ITSELF AS IT FLOWS THROUGH THE SOUTHEASTERN PORTION OF THE COUNTY. EVENTUALLY IT JOINS THE SOUTH FORK OF THE SALINE RIVER JUST BEFORE THE RIVER CROSSES INTO THE SOUTHWESTERN CORNER OF SALINE COUNTY.

DUE TO ITS SMALL SIZE THIS CREEK OFFERS A VERY LIMITED SPORT FISHING POTENTIAL. LARGE FISH THAT WOULD BE DESIRABLE TO THE ANGLER UNDOUBTEDLY ARE TAKEN AT TIMES FROM SOME OF THE DEEPER POOLS. LARGEMOUTH BASS, BLUEGILL, LONGEAR SUNFISH, PIRATE PERCH, TOP MINNOWS, AND VARIOUS OTHER MINNOW SPECIES ARE KNOWN TO BE PRESENT.

SUMMARY OF INVENTORY DATA

POPULATION AND AREA

THE POPULATION CHANGED VERY LITTLE FROM 1960, WHEN IT WAS 46,117, TO 1970, WHEN IT WAS 49,021. IT IS EXPECTED TO REMAIN FAIRLY CONSTANT THROUGH THE 70'S AND AN INCREASE TO 62,000 BY 2020 HAS BEEN PREDICTED (PETERSON, 1967). OF THE TOTAL POPULATION, 59.2 PERCENT HAS BEEN CLASSIFIED AS URBAN. THE 1970 POPULATION IN THE LARGER TOWNS WAS AS FOLLOWS:

MARION (COUNTY SEAT)	11,724
HERRIN	9,623
JOHNSTON CITY	3,928
CARTERVILLE	3,061

ALL OTHER COMMUNITIES HAD POPULATIONS OF LESS THAN 1,000.

IN 1970, WILLIAMSON COUNTY RANKED 26TH IN POPULATION AMONG THE 102 COUNTIES OF ILLINOIS AND HAD A POPULATION DENSITY OF 115 PEOPLE PER SQUARE MILE. WITH ITS 427 SQUARE MILES, IT RANKS 69TH IN LAND AREA. THERE ARE ABOUT 123,000 ACRES OF CROP AND PASTURE LAND AND 70,000 ACRES OF TIMBER; THE LATTER FIGURE REPRESENTING ABOUT 25 PERCENT OF THE ORIGINAL TIMBERLAND (MESTEL, 1968).

WATER RESOURCES

THE NUMBER OF ACRES IN LAKES AND PONDS PER CAPITA IS 0.25. WHEN THE STREAMS INCLUDED IN THIS REPORT ARE ADDED, THE ACREAGE PER CAPITA IS 0.26.

THERE ARE 13 PUBLIC AND ORGANIZATIONAL LAKES OF 6.0 SURFACE ACRES OR LARGER WITH A COMBINED TOTAL OF 10,208.5 ACRES. LOCATIONS ARE PRESENTED IN FIGURE 4. IN ADDITION, THERE ARE ABOUT 1,800 PRIVATELY OWNED LAKES AND PONDS COMPRISING ABOUT 2,176 ACRES OF WATER (TABLE 3).

WILLIAMSON COUNTY HAS FOUR PRINCIPAL STREAMS WITH A COMBINED LENGTH OF 68 MILES AND AN AREA OF 267.2 ACRES. THE BIG MUDDY RIVER, FOUND IN THE NORTHWESTERN PART OF THE COUNTY, IS THE MOST IMPORTANT RECREATIONAL STREAM. SOME OF THE MORE IMPORTANT RECREATIONAL FISHES ARE CHANNEL CATFISH, BULLHEADS, CRAPPIE, SUNFISHES, CARP, AND LARGEMOUTH BASS.

NEW PONDS HAVE BEEN ADDED AT A RATE OF 15 TO 20 PER YEAR WITH MOST OF THEM BEING ONE-HALF ACRE OR MORE IN SURFACE AREA. PONDS MAKE UP ABOUT 10 PERCENT OF THE TOTAL WATER ACREAGE IN THE COUNTY AND CAN OFFER QUALITY FISHING AND OTHER RECREATION ON A LIMITED BASIS.

TABLE 3

SUMMARY OF ADDITIONAL IMPOUNDMENTS

SIZE RANGE (ACRES	NUMBER	TOTAL ACREAGE
0.1 - 0.4	974	204.2
0.5 - 0.9	373	238.9
1.0 - 5.9	409	793.5
6.0 - 10.9	20	165.8
11.0 - 40.9	30	563.9
41 PLUS	1	210.0
TOTAL	1,807	2,176.3

Lake Morphometry and Origin

The lakes described in this report are artificial, meaning man-made lakes. All are watershed lakes having been formed by a dam across a valley. Their shorelines are generally irregular, with some having large bays and smaller cover or inlets. Lake of Egypt demonstrates such a shoreline as do Crab Orchard, Little Grassy and Devil's Kitchen. Such shorelines are typical of large artificial lakes and contrast to the more regular shorelines of natural bottomland lakes found along the major river floodplains in Illinois.

Devil's Kitchen Lake is by far the deepest, having a maximum depth of 90 feet. This does not mean that Devil's Kitchen contains more fish per surface acre than a shallow lake. The converse is true. The reason for this is that much of the bottom of Devil's Kitchen is unproductive of fish food organisms because sunlight, necessary for the production of plankton algae (the base of the fish food chain), cannot penetrate to the deeper layers. In a shallow lake the zone of productivity consists of a larger portion of the total surface area.

The type of watershed determines how rapidly water will run off during a rain and how quickly a lake will fill with sediment. The slowest runoff and least sediment occur from a timber watershed, followed by pasture and row crops. The latter is the least desirable and requires soil conservation practices, if the lake is to provide maximum recreational benefits.

Most of the ponds are man-made, the watershed runoff being impounded by a dam as with the lakes. Some are called dug-out ponds, with little or no watershed and depend primarily on direct rainfall for filling.

Water Quality

In stream surveys made in Williamson County in 1964, pH values ranged from 3.0 to 3.5 (Lopinot, 1965). A pH value indicates whether water might be too high in alkalinity (high pH) or have too much acidity (low pH) to sustain fish life. Fish are able to live in water having a pH range of about 5 to 10 (Bennett, 1971). A pH of 7.0 is considered neutral. Thus, the values obtained in the above mentioned survey indicated that the streams were unsuitable habitats for fishes. This was substantiated by the fact that no fishes were found at these stations. Poor water quality was due to discharge of runoff of water from coal mining operations.

Adequate dissolved oxygen is necessary to support fish. A lack of it sometimes occurs in shallow lakes in winter and summer. If ice forms and is covered with snow so sunlight cannot penetrate the ice, plants will not be able to manufacture oxygen in the process of photosynthesis. Under such circumstances, dissolved oxygen will be consumed by decaying organic matter and the level of dissolved oxygen needed to keep fish alive may be insufficient, resulting in a winter kill.

Fish mortality due to lack of oxygen can also occur during summer months after periods of high temperatures, several days of cloudy or partly cloudy skies, and little or no wind (Bennett, 1971).

To avoid winter and summer kill, adequate water depth is necessary. In Williamson County ponds and lakes should have at least 7 feet of water in 25 percent of the surface area.

Not only are a suitable pH and adequate dissolved oxygen needed, but water temperature can also be a limiting factor. Trout, for instance, require colder

WATER THAN LARGEMOUTH BASS. MANY LAKES AND PONDS IN SOUTHERN ILLINOIS HAVE COLD WATER DURING SUMMER MONTHS, BUT NOT ENOUGH DISSOLVED OXYGEN AT SUITABLE TEMPERATURES. IN A TYPICAL ARTIFICIAL SOUTHERN ILLINOIS LAKE, A WARM LAYER OF WATER DEVELOPS AT THE SURFACE DURING THE SUMMER AND MAY EXTEND DOWN SEVERAL FEET. BELOW THE UPPER LAYER (EPILIMNION) IS THE THERMOCLINE WHERE THE WATER TEMPERATURE AND AMOUNT OF OXYGEN DECREASE RAPIDLY WITH DEPTH. BELOW THE THERMOCLINE IS A LAYER OF COLD, UNOXYGINATED WATER, THE HYPOLIMNION. TROUT CANNOT LIVE IN THE COLD WATER SINCE THERE IS NOT ADEQUATE OXYGEN. IN THE WATER CONTAINING ADEQUATE OXYGEN, THE TEMPERATURE IS TOO HIGH FOR SURVIVAL.

FISHERIES

WILLIAMSON COUNTY HAS A NUMBER OF LARGE IMPOUNDMENTS ALL OF WHICH HAVE ADDED SIGNIFICANTLY TO THE FISHING AND RECREATIONAL POTENTIAL OF THE AREA. CRAB ORCHARD LAKE, LITTLE GRASSY, DEVIL'S KITCHEN AND LAKE OF EGYPT ARE THE LARGEST LAKES. ALL CONTAIN A VARIETY OF FISHES, THE MOST IMPORTANT OF WHICH FROM A SPORT FISHING STANDPOINT, ARE LARGEMOUTH BASS, BLUEGILL AND CRAPPIE. CRAB ORCHARD ALSO HAS A GOOD POPULATION OF CHANNEL CATFISH.

NOW THAT SOME COMMUNITIES ARE OBTAINING WATER FROM REND LAKE, OLD RESERVOIRS THAT FORMERLY SERVED AS MUNICIPAL WATER SUPPLIES OFFER MORE POTENTIAL AS SPORT FISHING LAKES. FISHERIES MANAGEMENT PRACTICES SUCH AS WATER LEVEL FLUCTUATIONS, AQUATIC WEED CONTROL, AND COMPLETE REHABILITATION OF UNDESIRABLE FISH POPULATIONS FOLLOWED BY RESTOCKING CAN NOW BE EMPLOYED.

MANY OF THE FARM PONDS THAT ARE NOT SUBJECT TO ENTRANCE BY RIVER AND STREAM FISHES HAVE BEEN STOCKED WITH LARGEMOUTH BASS AND BLUEGILL. WHILE A TYPICAL FARM POND CANNOT INDIVIDUALLY PROVIDE QUALITY FISHING UNDER HEAVY FISHING PRESSURE, IT CAN BE AN IMPORTATN RECREATIONAL FISHING ATTRACTION ON A LIMITED AND CONTROLLED BASIS. A 1963 STATE-WIDE SURVEY MADE BY THE DIVISION OF FISHERIES ON PONDS THAT HAD BEEN BUILT IN 1952 SHOWED THAT 36 PERCENT OF THE POND OWNERS FELT THEIR PONDS PRODUCED AVERAGE TO GOOD FISHING 10 YEARS AFTER THEY WERE STOCKED (PRICE, 1964). EVEN THOUGH SUCH A PERCENTAGE POINTS OUT A NEED FOR MORE FISH POND MANAGEMENT, IT ALSO SHOWS THAT PONDS CAN PROVIDE RECREATION OVER AN EXTENDED PERIOD OF TIME.

THERE ARE TWO FEE FISHING AREAS IN THE COUNTY, ONE BEING LOCATED NEAR HERRIN AND THE OTHER SOUTH OF CRAB ORCHARD LAKE. BOTH OFFER SUCH SPECIES AS LARGEMOUTH BASS, SUNFISHES AND BULLHEADS.

THE STREAMS OF THE COUNTY DO NOT CONTAIN SUFFICIENT POUNDAGES OF SUCH FISHES AS CARP AND BUFFALO TO WARRANT COMMERCIAL HARVEST. SUCH FISHING HAS BEEN UNDERTAKEN PERIODICALLY AT CRAB ORCHARD LAKE.

A LIST OF FISHES RECORDED FOR WILLIAMSON COUNTY IS PRESENTED IN TABLE 4. FREQUENCY OF OCCURRENCE OF SOME OF THE SPECIES IS GIVEN IN FIGURE 7.

WETLANDS

WETLANDS, AS CONSIDERED IN THIS REPORT, ARE THOSE LANDS WITH FREQUENT OVERFLOW AND HIGH WATER TABLES, MAKING THEM TOO WET FOR CULTIVATION. THERE ARE APPROXIMATELY 300 SUCH ACRES IN WILLIAMSON COUNTY.

THESE LANDS TYPICALLY HAVE PIN OAK AND WILLOW TREES, BUTTON BUSH, AND CATTAIL AND SEDGES IF THERE IS MORE OR LESS PERMANENT WATER. SQUIRRELS, WHITETAIL DEER, RABBITS, WOOD DUCKS AND SHORE BIRDS FREQUENT THESE AREAS.

Public Use and Access

Except for organizational (club and association) waters, all the lakes listed in this report are open to public fishing. Crab Orchard and Lake of Egypt have the widest range of recreational activities, including fishing, hunting, water-skiing, swimming, camping and picnicking. Horsepower limitations or size of lake restricts certain water sports on the others.

Table 5 is a summary of visitor activities at Crab Orchard Wildlife Refuge during the period 1968 - 1971. Data from Crab Orchard, Little Grassy and Devil's Kitchen is combined. For comparion in trends, Table 7 summarizes park attendance and camping on a state-wide basis. It should be pointed out that adverse weather conditions were thought to be at least partly responsible for certain decreases in visitor activities at Crab Orchard Refuge.

There is a moderate amount of angler usage on the Big Muddy River, with access being primarily from nearby county roads. Access over private property is controlled by the landowner.

A summary of public owned land is given in Table 6.

Cottage and Homesite Development

There are a large number of cabins, home and future homesites on the privately developed portion of the Lake of Egypt shoreline. Several real estate development companies are in existence at the lake and many of the homes are permanent residences.

On the federal lakes, there are no privately owned cottages or homes. At Little Grassy, a number of organizations have facilities for club meetings, summer camps and so forth.

At publically owned lakes such as Marion Reservoir, Johnston City Reservoir, and Herrin Old and New Reservoirs, the shorelines have not been developed for private homes or cottages.

The club or organizational waters such as Lake Tacoma, Marion Country Club, Teal Lake, and K. P. Club have a number of cabins or cottages along the shoreline.

TABLE 6

PUBLIC OWNED LAND

	ACRES
State of Illinois	110.0
U. S. Department of the Interior	43,000.0
U. S. Forest Service	324.5
TOTAL	43,434.5

TABLE 4

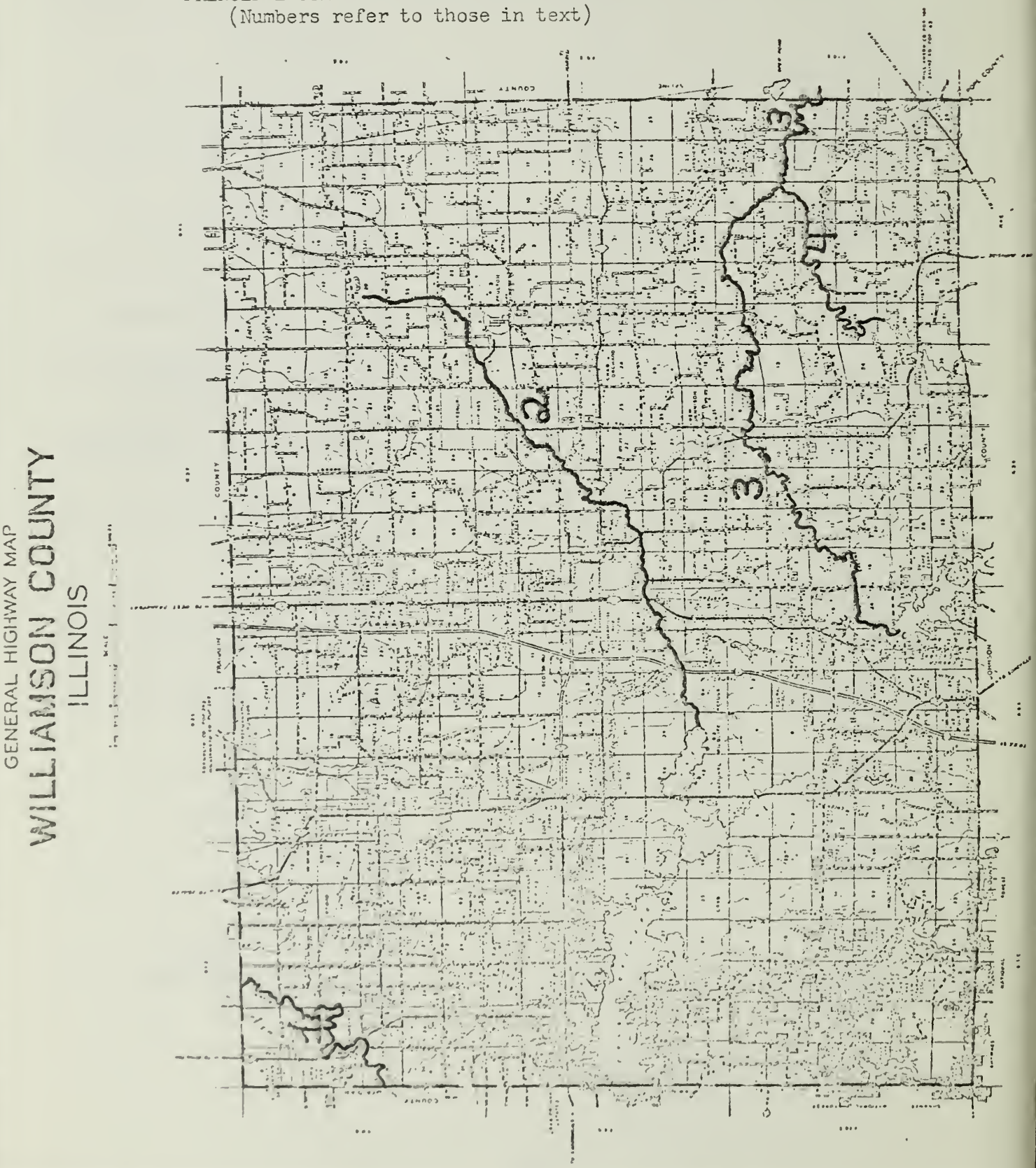
SPECIES OF FISH KNOWN TO OCCUR IN WILLIAMSON COUNTY

Common Name*	Scientific Name
Bigmouth buffalo	Ictiobus cyprinellus
Black bullhead	Ictalurus melas
Black crappie	Pomoxis nigromaculatus
Blacksspotted topminnow	Fundulus olivaceus
Blackstripe topminnow	Fundulus notatus
Bluegill	Lepomis macrochirus
Bluntnose minnow	Pimephales notatus
Brook silverside	Labidesthes sicculus
Carp	Cyprinus carpio
Channel catfish	Ictaluras punctatus
Creek chub	Semotilus atromaculatus
Creek chubsucker	Erimyzon oblongus
Flier	Centrarchus macropterus
Freshwater drum	Aplodinotus grunniens
Gizzard shad	Dorosoma cepedianum
Golden shiner	Notemigonus crysoleucas
Grass pickerel	Esox americanus vermiculatus
Green sunfish	Lepomis cyanellus
Largemouth bass	Micropterus salmoides
Logperch	Percina caprodes
Longear sunfish	Lepomis megalotis
Mosquitofish	Gambusia affinis
Northern pike	Esox lucius
Orangespotted sunfish	Lepomis humilis
Orangethroat darter	Etheostoma spectabile
Pirate perch	Aphredoderus sayanus
Pumpkinseed	Lepomis gibbosus
Redear sunfish	Lepomis microlophus
Redfin shiner	Notropis umbratilis
Ribbon shiner	Notropis fumeus
Rock bass	Ambloplites rupestris
Smallmouth buffalo	Ictiobus bubalus
Spotfin shiner	Notropis spilopterus
Spotted sucker	Minytrema melanops
Tadpole madtom	Noturus gyrinus
Threadfin shad	Dorosoma petenense
Warmouth	Lepomis gulosus
White bass	Morone chrysops
White sucker	Catostomus commersoni
Yellow bass	Morone mississippiensis
Yellow bullhead	Ictalurus natalis
Yellow perch	Perca flavescens

*(American Fisheries Society, 1970)

FIGURE 6

PRINCIPAL STREAMS IN WILLIAMSON COUNTY
(Numbers refer to those in text)



SEE PAGE 55 FOR LEGEND

FIGURE 7

FREQUENCY OF OCCURRENCE OF FISHES SAMPLED FROM 13 WILLIAMSON COUNTY LAKES

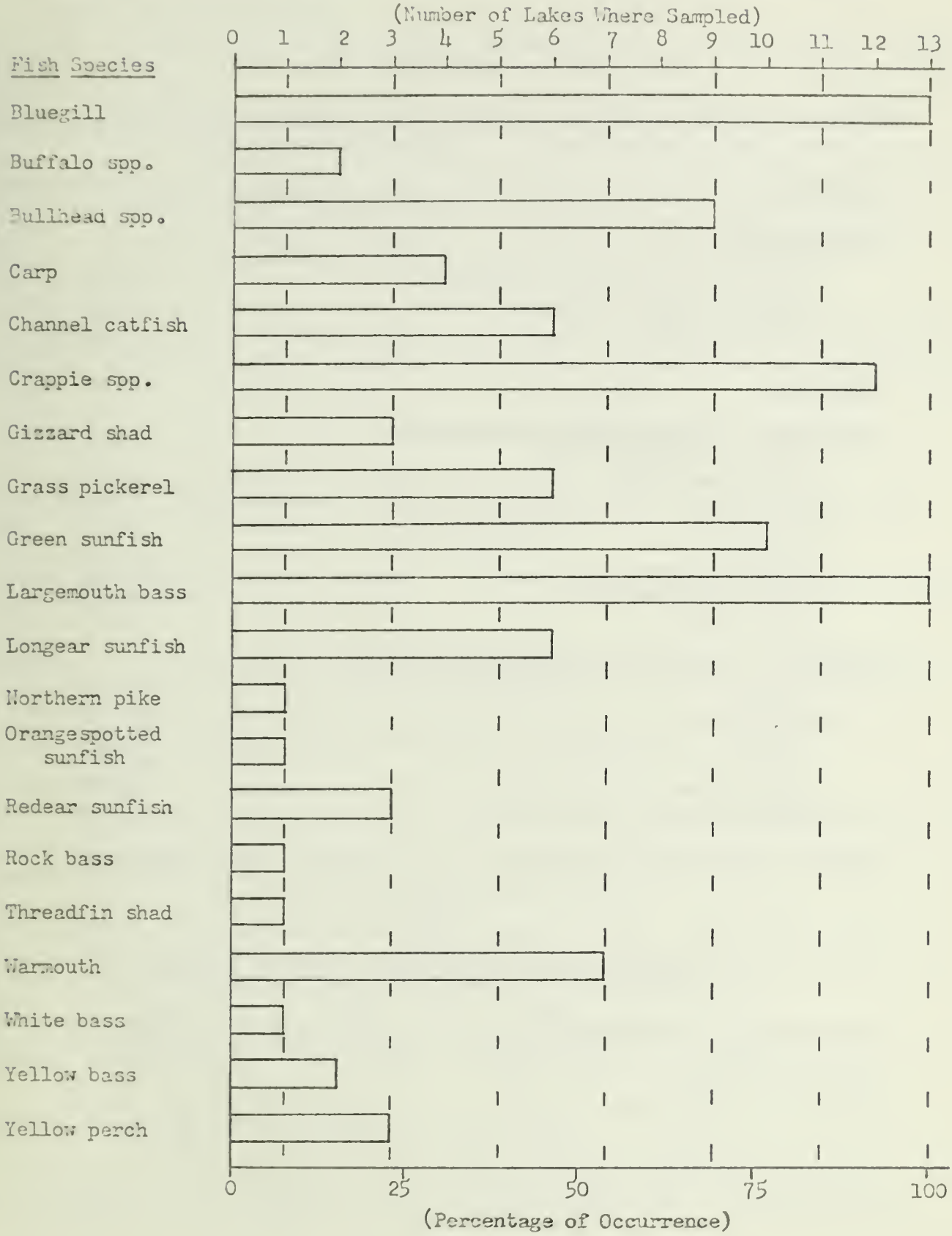


TABLE 5

SUMMARY OF VISITOR ACTIVITIES AT CRAB ORCHARD NATIONAL WILDLIFE REFUGE IN 1972

Activity	Number of Visits
Interpretation	
Wildlife Trails - Nonmotorized	8,646
Wildlife Tour Routes - Motorized	12,449
Exhibits - Demonstrations	1,135
Other programs	5,749
Education	13,217
Recreation - Wildlife/Wildlands Oriented	
Hunting Migratory Birds	8,468
Upland Game Birds	1,100
Big Game	5,900
Small Game	1,000
Fishing	157,700
Wildlife Observations	345,550
Wildlife Appreciation	154,650
Field Trials	1,187
Recreation - Non Wildlife/Wildlands Oriented	
Camping	137,890
Picnicking	147,650
Swimming	218,450
Boating	210,550
Water skiing	46,500
Other	1,500
TOTALS - All Visitor Activities	1,479,291

TABLE 7

PARK ATTENDANCE AND CAMPING - STATE OF ILLINOIS

	1968	1969	1970	1971
PARK ATTENDANCE (STATE-WIDE BASIS)	22,470,073	22,730,019	24,163,319	25,893,977
CAMPING ATTENDANCE (STATE-WIDE BASIS)	660,074	630,869	589,521	634,407

PRESENT AND POTENTIAL USES OF SURFACE WATERS

THIS SECTION DISCUSSES SOME OF THE VARIED USES THAT ARE NOW BEING MADE OF THE SURFACE WATER AND SOME OF THE POSSIBILITIES FOR ADDING RECREATIONAL AREAS.

FISHING (SPORT AND COMMERCIAL)

SPORT FISHING LICENSE SALES (RESIDENT, NONRESIDENT, 10-DAY AND SPECIAL) DURING THE 10-YEAR PERIOD BEGINNING IN 1960 INCREASED IN WILLIAMSON COUNTY AND THROUGHOUT THE STATE (FIG. 8).

SOME OF THE BETTER KNOWN FISHING LAKES IN THE STATE ARE IN OR PARTIALLY CONTAINED IN THE COUNTY. CRAB ORCHARD, LITTLE GRASSY AND DEVIL'S KITCHEN LAKES IN THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE AND LAKE OF EGYPT, THE DAM AND LOWER PORTION OF WHICH IS IN THE COUNTY, HAVE FISH POPULATIONS CONTAINING LARGEMOUTH BASS, CRAPPIE, AND BLUEGILL IN SIZES OF INTEREST TO ANGLERS. ALL ARE BEST KNOWN FOR BASS FISHING. CRAB ORCHARD ALSO PRODUCES GOOD FISHING FOR CHANNEL CATFISH.

THERE IS A LIMITED SPORT FISHERY IN THE BIG MUDDY RIVER FOR CRAPPIE, BULLHEADS AND CHANNEL CAT AND IN THE SOUTH FORK OF THE SALINE RIVER FOR BULLHEADS AND SUNFISHES. AT TIMES, PARTICULARLY IN THE SPRING, THERE IS GOOD FISHING BELOW THE DAM AT DEVIL'S KITCHEN AND AT LITTLE GRASSY LAKE.

A NUMBER OF LAKE SITES EXIST IN THE COUNTY AND ARE SHOWN IN FIGURE 10.

SITE NO. 1 WAS MENTIONED AS A POSSIBILITY FOR INCLUSION IN THE SOUTH FORK OF SALINE RIVER P. L. 566 WATERSHED PRELIMINARY INVESTIGATION REPORT. LOCATED ON SUGAR CREEK, IT COULD IMPOUND A LAKE OF 920 ACRES.

THE FOLLOWING SITES WERE INCLUDED IN A REPORT BY THE ILLINOIS STATE WATER SURVEY (ILLINOIS DEPT. OF REG. & ED., 1962).

NUMBER 2 COULD HAVE A POOL AREA OF 90 SURFACE ACRES, A DEPTH OF 30 FEET AND A WATERSHED AREA OF 1.2 SQUARE MILES. IT IS LOCATED ON A BRANCH OF BANKSTON FORK.

NUMBER 3, ON A BRANCH OF LAKE CREEK, COULD IMPOUND 70 ACRES OF WATER WITH A DEPTH OF 20 FEET AND HAVE A DRAINAGE AREA OF 1.4 SQUARE MILES.

SITE NUMBER 4 IS LOCATED ABOVE DEVIL'S KITCHEN LAKE ON GRASSY CREEK. IT COULD HAVE A POOL AREA OF 470 ACRES, A DEPTH OF 72 FEET AND A WATERSHED OF 5.9 SQUARE MILES.

A SITE ON CANEY BRANCH (NUMBER 5) COULD IMPOUND A LAKE WITH AN AREA OF 200 ACRES, A DEPTH OF 25 FEET AND A WATERSHED OF 3.5 SQUARE MILES.

TWO SITES WERE INCLUDED ON WOLF CREEK. NUMBER 6 COULD IMPOUND 230 ACRES WITH A DEPTH OF 40 FEET AND A WATERSHED OF 7.5 SQUARE MILES. NUMBER 7 COULD HAVE 370 ACRES OF WATER, A DEPTH OF 72 FEET AND DRAIN AN AREA OF 3.3 SQUARE MILES.

ON GRASSY CREEK NEAR STONEFORT, A SITE EXISTS (NUMBER 8) THAT COULD IMPOUND 500 ACRES WITH A DEPTH OF 20 FEET AND HAVE A DRAINAGE AREA OF 7.0 SQUARE MILES.

A 150-ACRE SITE (NUMBER 9) EXISTS ON A BRANCH OF SUGAR CREEK. IT WOULD HAVE A DEPTH OF 30 FEET AND DRAIN 2.4 SQUARE MILES.

TWO SITES ON SOUTH FORK SALINE RIVER WERE MENTIONED IN THE REPORT. LAKE OF EGYPT HAS BEEN BUILT ON ONE OF THESE SITES. THE OTHER (NUMBER 10) IS DOWNSTREAM FROM LAKE OF EGYPT. IT COULD CONTAIN A LAKE OF 580 ACRES WITH A DEPTH OF 24 FEET AND A

FIGURE 8

SPORT FISHING LICENSE SALES
(Resident, Non-resident, 10 Day and Special)

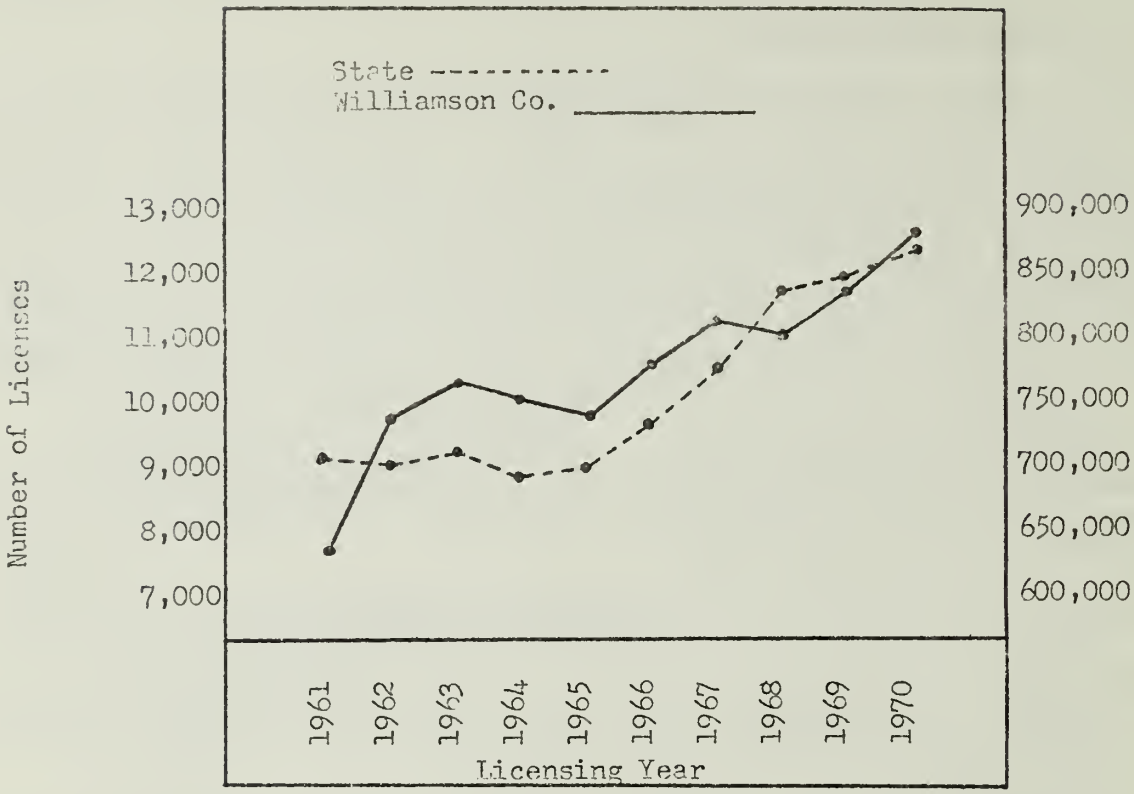
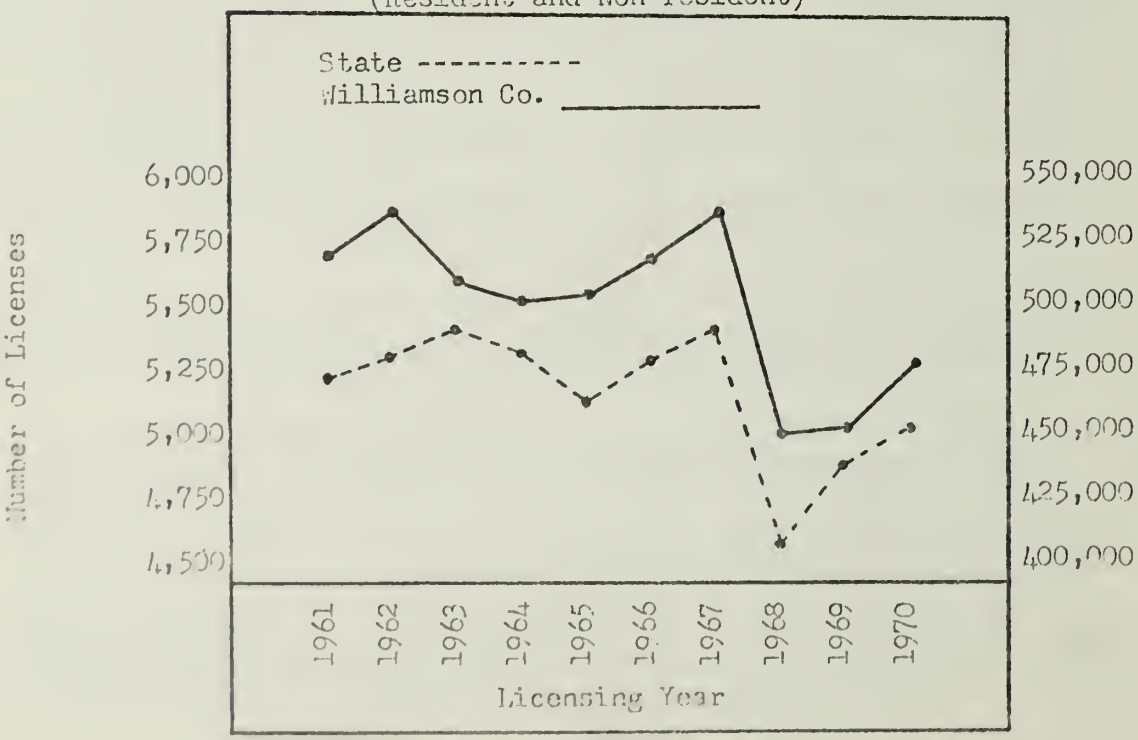


FIGURE 9

HUNTING LICENSE SALES
(Resident and Non-resident)



DRAINAGE AREA OF 54.9 SQUARE MILES.

THERE ARE TWO FEE FISHING AREAS IN THE COUNTY; ONE NEAR HERRIN AND THE OTHER NEAR CRAB ORCHARD LAKE ON THE SOUTH SIDE.

COMMERCIAL SPECIES SUCH AS CARP AND BUFFALO DO NOT EXIST IN COUNTY STREAMS IN POUNDAGES SUFFICIENT TO WARRANT COMMERCIAL FISHING. THERE HAS BEEN COMMERCIAL REMOVAL OF CARP FROM CRAB ORCHARD LAKE FROM TIME TO TIME.

AN INTEREST HAS DEVELOPED IN RECENT YEARS IN SOUTHERN ILLINOIS IN THE PROPOGATION AND COMMERCIAL PRODUCTION OF CHANNEL CATFISH. HOWEVER, THE POTENTIAL FOR CATFISH FARMING IS LIMITED DUE TO A SHORT GROWING SEASON, LACK OF ECONOMICAL WATER SUPPLIES AND UNEXPLORED MARKETS FOR THE HIGHER PRICED DOMESTIC PRODUCT (LOPINOT & FISHER, 1969).

BOATING

SINCE THE ILLINOIS BOAT REGISTRATION AND SAFETY ACT WENT INTO EFFECT IN 1960, 2,419 BOATS HAVE BEEN REGISTERED IN THE COUNTY.

LARGE HORSEPOWER BOATING IS ALLOWED IN LAKE OF EGYPT, WITH CERTAIN AREAS ZONED AGAINST HIGH SPEEDS. CRAB ORCHARD LAKE IS ALSO A POPULAR WATER SPORTS AREA WITH WATER-SKIING AND SAIL BOATING COMMON SITES IN THE WARM MONTHS. THE OTHER PRINCIPAL IMPOUNDMENTS EITHER HAVE HORSEPOWER LIMITATIONS OR OUTBOARD MOTORS OR ARE TOO SMALL FOR HIGH SPEED BOATING.

THERE ARE NO STREAMS IN THE COUNTY SUITABLE FOR CANOEING.

SWIMMING

PUBLIC SWIMMING IS ALLOWED AT LAKE OF EGYPT, CRAB ORCHARD, DEVIL'S KITCHEN AND LITTLE GRASSY. A PUBLIC SWIMMING POOL IS LOCATED IN MARION.

THE POTENTIAL IN THE COUNTY FOR THE DEVELOPMENT OF WATER SPORTS AREAS WHICH WOULD INVOLVE BOATING, SWIMMING, SUNBATHING, WATER-SKIING AND SKIN DIVING HAS BEEN RATED HIGH (MICK AND HAMILTON, 1967).

PARK ATTENDANCE AND CAMPING

PARK ATTENDANCE AND CAMPING ARE BECOMING INCREASINGLY MORE POPULAR IN ILLINOIS. THE LATTER IS CONSIDERED TO BE THE FASTEST GROWING ACTIVITY AT STATE AND FEDERAL RECREATIONAL AREAS (ILL. DEPT. OF BUS. AND ECON. DEV., 1965).

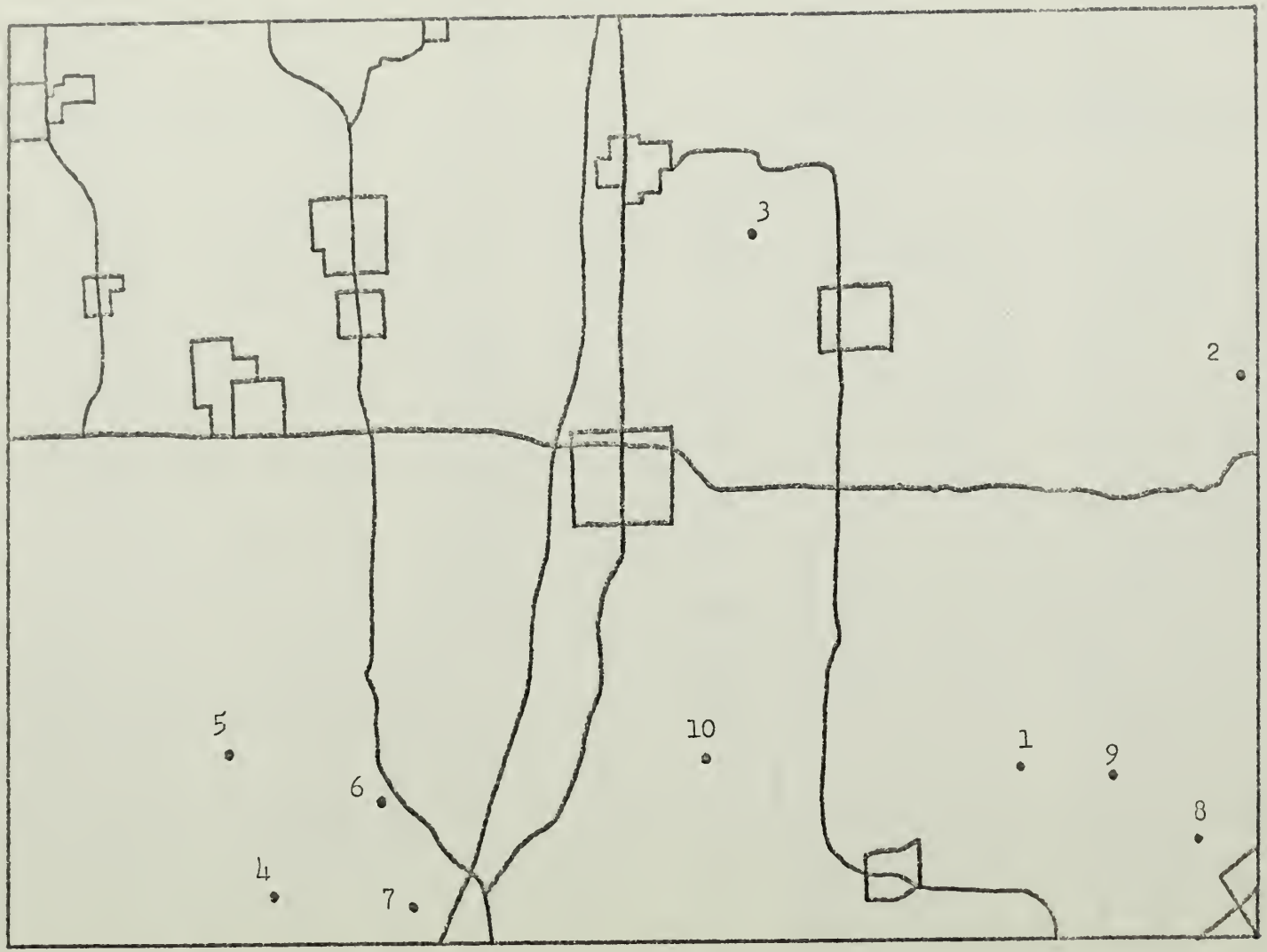
A SYNOPSIS OF RECREATIONAL ACTIVITIES AT CRAB ORCHARD WILDLIFE REFUGE IS PRESENTED IN TABLE 5.

ONE OF THE MORE POPULAR VISITOR USE LOCATIONS IN THE COUNTY IS THE STATE FISH HATCHERY LOCATED JUST TO THE NORTH OF THE SPILLWAY AT LITTLE GRASSY LAKE. THE PONDS ARE USED TO PRODUCE FINGERLING LARGEMOUTH BASS, BLUEGILL AND REDEAR SUNFISH FOR STOCKING IN NEWLY CREATED WATERS OR IN LAKES AND PONDS IN WHICH UNDESIRABLE FISH POPULATIONS HAVE BEEN REMOVED.

AS MORE LEISURE TIME BRINGS ABOUT A GREATER DEMAND FOR RECREATIONAL OPPORTUNITIES, PARK ATTENDANCE AND CAMPING WILL ALSO INCREASE. IN KEEPING WITH THIS DEMAND, THE ESTABLISHMENT OF CAMPGROUNDS SHOULD BE AN IMPORTANT PART IN FUTURE PUBLIC LAKE DEVELOPMENT. THE POTENTIAL FOR DEVELOPING VACATION AND TRANSIENT CAMPING AREAS ON PRIVATE LAND HAS BEEN RATED HIGH AND MEDIUM RESPECTIVELY (MICK & HAMILTON, 1967).

FIGURE 10

POTENTIAL LAKE SITES



Numbers refer to those in text.
Refer to Figure 4 for names of towns and highway route numbers.

Hunting and Trapping

Hunting license sales for Williamson County and throughout the state during a 10-year period beginning in 1960 and shown in Figure 9. Table 8 shows the species and relative abundance of game populations in the county.

Much of the hunting in Williamson County is on private land with permission not too difficult to obtain. Hunting opportunities are furnished on private land surrounding the Crab Orchard National Wildlife Refuge because of the concentrations of waterfowl in the refuge. There is also public hunting on the refuge itself. Additional public hunting land exists on lands within the Shawnee National Forest. Most of this borders or is near the Crab Orchard National Wildlife Refuge.

One of the wildlife and recreational potentials for the county would be the inclusion of more of the less developed areas into the Shawnee National Forest. Such areas could then be developed to the highest carrying capacity for deer, turkey and grouse by a continuation of the present development work on U. S. Forest Service lands. Much work has been done by the Forest Service in cooperation with the Illinois Department of Conservation in developing ponds, food patches and openings in forest land for nesting and food production. Some of the property purchased by the Forest Service is abandoned farm land with excellent cover, and efforts are being made to maintain optimum conditions for game.

There is good potential for developing hunting areas in the county, and some landowners have considered and worked on this potential for additional income. The topography of the county lends itself well to game production, since many of the farms have areas suitable only to timber, areas of thin soil, ditchbanks, brushy fence rows, pond areas and odd field corners.

Table 9 is a record of hunter success in the county and on a state-wide basis. The information was collected from mail questionnaires sent to hunting license holders. The data shows that hunter success was near the state average for most species and better than average for quail. Quail and rabbit hunting is exceptionally good in parts of the county due to the interspersion of good cover for nesting and winter protection along with grain crops in relatively small fields.

Removal of timber was the main cause of extermination of the woodland species such as deer, turkey, ruffed grouse, wolf, bear and bobcat. Deer and turkey have been restocked and are doing well; indicating that the increase in hunting pressure with no game laws, as well as timber destruction, contributed to their earlier extermination. Beavers have been reintroduced and are well established. Quail have also benefited by the advent of man.

Every person concerned with wildlife conservation should continually keep in mind that habitat management is the primary method of attaining high game populations. While it is not possible or feasible to have high populations of all game species, it is possible by careful management and conservation to have abundant populations of most of them in their particular type of habitat (Mestel, 1968).

It has been predicted that the amount of cropland will decrease 800 acres by 1975 and that pasture land will increase by 7,000 acres (Coop. Extension Service, U. of Ill., 1962). This should not affect game populations adversely, if attention is given to the needs of wildlife (Mestel, 1968).

Aesthetics

Rich in water acreage, the county offers a variety of water oriented aesthetic

TABLE 8

PRESENT GAME POPULATION OF WILLIAMSON COUNTY

Mammals	Abundance
Cottontail Rabbit	Abundant
Grey Squirrel	Abundant
Fox Squirrel	Abundant
White-tailed Deer	Abundant
Woodchuck	Common
Opossum	Abundant
Red Fox	Abundant
Grey Fox	Common
Coyote	Rare
Furbearers	
Raccoon	Abundant
Mink	Common
Skunk	Abundant
Weasel	Low
Muskrat	Abundant
Beaver	Common
Game Birds	
Turkey	Low
Quail	Abundant
Mourning Dove	Abundant

(Mestel, 1968)

VALUES. THE QUIETNESS OF A SAILBOAT RIDE ON CRAB ORCHARD LAKE, CANOEING ALONG TIMBERED SHORELINES ON DEVIL'S KITCHEN, LITTLE GRASSY AND LAKE OF EGYPT, WATCHING A BRACE OF MALLARDS LAND ON A FARM POND AT DUSK ARE EXAMPLES OF THE KINDS OF EXPERIENCES THAT CANNOT BE MEASURED IN TERMS OF DOLLARS AND CENTS BUT ARE, NEVERTHELESS, VERY REWARDING TO THE INDIVIDUAL WHO APPRECIATED THEM. AESTHETICS ARE IMPORTANT ASSETS TO THE COUNTY AND ARE WORTHY OF ENHANCEMENT AND PRESERVATION WHERE POSSIBLE.

TABLE 9

AVERAGE KILL PER HUNT

	DOVE	SQUIRREL	RABBIT	RACCOON	QUAIL
WILLIAMSON COUNTY	3.64	1.72	1.97	1.18	3.37
STATE-WIDE 1956-1963	3.52	2.38	2.06	1.50	2.89

MESTEL, 1968

SURFACE WATER PROBLEMS

STREAM POLLUTION IS THE MOST IMPORTANT PROBLEM AFFECTING SURFACE WATERS. IT EXISTS MOST NOTABLY IN THE FORM OF SILTATION, AS A RESULT OF SOIL EROSION, AND ACID MINE WASTE. FLUCTUATING WATER LEVELS ARE ALSO DISCUSSED IN THIS SECTION.

POLLUTION

VERY LITTLE POLLUTION FROM SILTATION OCCURS IN THE FORESTED AREAS OF THE COUNTY OR FROM LAND THAT IS UTILIZED AS PASTURE. HOWEVER, WHERE ROW CROPS PREDOMINATE, SOME SILTATION INVARIABLY OCCURS. WHEN SILT REACHES A STREAM, IT IS CONSIDERED A FORM OF WATER POLLUTION. EXCESSIVE SILTATION RANKS FIRST AMONG THE ENVIRONMENTAL CHANGES RESPONSIBLE FOR THE EXTIRPATION OR DECIMATION OF FISH SPECIES IN ILLINOIS (SMITH, 1971). PART OF THE SILT WASHED INTO A STREAM SETTLES TO THE BOTTOM AS SEDIMENT. SEDIMENT AFFECTS THE CAPACITY OF A STREAM TO PRODUCE AQUATIC ORGANISMS VITAL TO BIOLOGICAL BALANCE AND FISH LIFE AND CAN DESTROY SPAWNING SITES. TURBID WATER CAUSED BY SILT REMAINING IN SUSPENSION CAN BRING ABOUT DISAPPEARANCE OF AQUATIC VEGETATION. SUCH ALTERNATIONS IN A STREAM HABITAT TEND TO FAVOR THE BUILDUP OF ROUGH OR COMMERCIAL FISHES AT THE EXPENSE OF GAME FISHES.

CRAB ORCHARD CREEK, POND CREEK AND LAKE CREEK ARE POLLUTED WITH ACID WASTE FROM COAL MINES (TABLE 10). WATER DRAINING FROM BITUMINOUS COAL MINES NEARLY ALWAYS CONTAINS SULFURIC ACID. THIS ACID IS FORMED BY THE OXIDATION OF SULFUR OCCURRING IN THE COAL AND IN THE ROCK AND CLAY FOUND ABOVE AND BELOW THE COAL SEAMS. IN THE PRESENCE OF WATER AND UNDER THE INFLUENCE OF OXYGEN IN THE AIR OF THE MINE, THE SULFUR IS OXIDIZED AND, STILL COMBINED WITH IRON, DISSOLVES IN THE WATER AS "COPPERAS", MORE PROPERLY CALLED FERROUS SULFATE. THE IRON, AFTER THIS OXIDATION, HAS A WEAKENED AFFINITY FOR SULFURIC ACID AND IS PARTIALLY SEPARATED AS A BROWNISH-YELLOW SEDIMENT FREQUENTLY CALLED "YELLOW BOY." SULFURIC ACID, ACCOMPANIED BY SOME IRON, REMAINS IN THE WATER. WHEN SULFURIC ACID IS DISCHARGED INTO A STREAM IN QUANTITIES SUFFICIENT TO RENDER THE WATER DISTINCTLY ACIDIC, FISH ARE UNABLE TO LIVE, SINCE THROUGH DAMAGING OF THEIR GILLS, THEY ARE UNABLE TO SEPARATE OXYGEN FROM THE WATER AND DIE OF SUFFOCATION (KLASSEN, 1965).

THE STATE OF ILLINOIS SANITARY WATER BOARD HAS WORKED WITH THE COAL INDUSTRY TO ENCOURAGE EFFECTIVE CONTROL. THE SURFACED-MINED LAND RECLAMATION ACT WAS SET UP TO IMPROVE CONDITIONS AT WORKING MINES AND AFTER THEY ARE ABANDONED. MANY OF THE ACTIVE MINE COMPANIES HAVE IMPROVED THEIR OPERATING PROCEDURES AND DRAINAGE PROBLEMS TO REDUCE ACID MINE WATER. IN THE AREAS OF OLD ABANDONED WORKINGS, WHICH CONTINUE TO PRODUCE ACID, IT HAS BEEN MORE DIFFICULT TO EFFECT IMPROVEMENTS. IT WILL TAKE THE FULL COOPERATION OF ALL ELEMENTS OF THE ECONOMY OF THE AREA TO BRING ABOUT IMPROVEMENTS, (KLASSEN, 1965).

AN ATTEMPT AT DEVELOPING METHODS FOR ACID MINE POLLUTION CONTROL AT A STRIP MINE AREA SOUTH OF CRAB ORCHARD IS BEING MADE BY THE U. S. FOREST SERVICE. TREATED MUNICIPAL SEWAGE IS BEING APPLIED TO SEE IF IT CAN REDUCE ACID DRAINAGE, CONTROL EROSION AND ESTABLISHED VEGETATIVE COVER. SATISFACTORY SOLUTIONS TO PROBLEMS OF ACID MINE WASTES AND THEIR APPLICATION WOULD HAVE FAR REACHING EFFECTS IN RECOVERING MANY MILES OF STREAMS NOT ONLY IN ILLINOIS BUT IN MANY OTHER STATES AS WELL.

DOMESTIC SEWAGE AND ORGANIC WASTES CAN POLLUTE SURFACE WATERS BY CAUSING NUISANCE ALGAE AND AQUATIC WEED PROBLEMS AND BY ADDING MATERIALS THAT REDUCE DISSOLVED OXYGEN DURING THE PROCESS OF DECAY. SUCH PROBLEMS ARE GREATER NEAR METROPOLITAN AREAS AND HAVE NOT BEEN SERIOUS ENOUGH IN WILLIAMSON COUNTY TO CAUSE HEAVY FISH KILLS IN STREAMS OR LARGE LAKES. POND FISH KILLS DUE TO FEED OR BARN LOT DRAINAGE ARE NOT UNCOMMON, HOWEVER.

TABLE 10

PHYSICAL FEATURES RELATIVE TO SAMPLING STATIONS

Stream	Date	Visible Industrial Pollution	pH	Turbidity (Inches)	Predominant Bottom Type	Maximum Depth (Ft.)	Flow (F/S)	Fishermen Usage
Pond Creek	7 July 1964	Yes	3.5	60+	Silt	5.0	Trace	None
Lake Creek	7 July 1964	Yes	3.5	36+	Silt	3.0	Trace	None
Crab Orchard Creek	7 July 1964	Yes	3.0	36+	Silt	3.0	Trace	None

(Lopinot, 1965)

An upgrading of waste treatment facilities will be needed as population densities increase. Recent awareness of the public to pollution problems and new and tougher pollution control laws should have a profound effect in minimizing or eliminating these problems.

There are hundreds of chemicals, of which pesticides are a part, that pose a new environmental health problem not only to lower animals but also to man. It is impossible to predict the effects of lifetime exposure to chemical and physical agents that are not a part of the biological experience of man. D.D.T., for instance, is toxic to fish and has been linked to sterility in birds; there is also evidence that it can be detrimental to the health of man (Carson, 1962).

Fluctuating Water Levels

Water loss due to evaporation usually occurs in impoundments in late summer. With respect to usability of waters for recreational purposes, such losses are not particularly significant. Some of the smaller streams lose their flow and contain only pools during extended periods of no rainfall, but there is little recreational activity on those stretches of streams even in high water, so the loss from that standpoint is for practical purposes immaterial.

High water levels in streams can pose a fisheries management problem for adjacent ponds and lakes by allowing the entrance of undesirable fishes. The possibility of such contamination should be taken into consideration by anyone interested in creating fishing or fish rearing waters in areas where flooding may occur.

THE FUTURE

If Williamson County is to have quality water oriented recreation in the future, wise management of existing resources and the addition of new ones will be important--particularly as the population begins to increase. With greater numbers of people, faster highways and more leisure time, usage will multiply and with it will come sharper conflicts of interest. But as long as successive generations regard outdoor recreation and associated aesthetics as being important to the basic welfare of mankind, the future problems would not seem insurmountable.

BIBLIOGRAPHY

American Fisheries Society. 1970. A List of Common and Scientific Names of Fishes from the United States and Canada. Special Publication No. 6, Third Edition. Washington, D. C. 150 pages.

Barrett, Edward J. 1952. Counties of Illinois, Their Origin and Evolution. Secretary of State, Springfield, Illinois. 65 pages.

Bennett, George W. 1971. Management of Lakes and Ponds. Second Edition. Van Nostrand Reinhold Co., New York and Canada. 375 pages.

Carson, Rachel. 1962. Silent Spring. The Riverside Press, Cambridge, Massachusetts. 368 pages.

Cooperative Extension Service, University of Illinois. 1962. Illinois Soil and Water Conservation Needs Inventory. Urbana, Illinois. 116 pages.

Fehrenbacher and Odell. 1959. Williamson County Soils. Soil Report 79. University of Illinois Agricultural Experiment Station, Urbana, Illinois and Soil Conservation Service, U. S. Department of Agriculture. 72 pages.

Frye, John C. 1961. Guide to the Geologic Map of Illinois. Illinois State Geological Survey, Urbana, Illinois. 24 pages.

Illinois Cooperative Extension Service. 1971. Illinois Area Resource Development. Newsletter No. 60. Urbana, Illinois. 5 pages.

Illinois Department of Business and Economic Development. 1965. Outdoor Recreation in Illinois. Springfield, Illinois. 184 pages.

Illinois Department of Registration and Education. 1962. Potential Water Resources of Southern Illinois. Report of Investigation 31. Springfield, Illinois. 97 pages.

Joos, Lothar A. 1960. Freeze Probabilities in Illinois. Bulletin 650. University of Illinois Agricultural Experiment Station, Urbana, Illinois. 11 pages.

Klassen, Clarence W. 1965. Saline River-Stream Pollution. Illinois Department of Public Health, Springfield, Illinois. (A letter to Saline Valley Conservancy District).

Leighton, M. W., Ekblaw, George E., & Horbert, Leland. 1948. Physiographic Division of Illinois. Report of Inventory No. 129. Illinois State Geological Survey, Urbana, Illinois. 33 pages.

Lopinot, Alvin C. 1964. Inventory of the Fishes of Four River Basins in Illinois. Special Fisheries Report No. 3. Illinois Department of Conservation, Springfield, Illinois. 61 pages.

Lopinot, Alvin C. 1965. Inventory of the Fishes of Four River Basins in Illinois. Special Fisheries Report No. 8. Illinois Department of Conservation, Springfield, Illinois. 81 pages.

Lopinot, Alvin C. & Fisher, Ray. 1969. Potentials of Catfish Farming in Illinois. Illinois Department of Conservation, Springfield, Illinois. 21 pages.

Mestel, Bill. 1968. Williamson County, Illinois Wildlife Resources. Illinois Department of Conservation, Springfield, Illinois. 13 pages.

Mick, C. E. & Hamilton, Rex. 1967. An Appraisal of Potential for Outdoor Recreation Development of the Area of Shawnee Resource Conservation and Development Project. Soil Conservation Service, U. S. Department of Agriculture, Champaign, Illinois. 88 pages.

Peterson, Helen C. 1967. Water for Illinois, A Plan for Action. Illinois Department of Business and Economic Development, Springfield, Illinois. 452 pages.

Price, Ora M. 1964. 1963 Farm Pond Survey. Special Fisheries Report No. 5. Illinois Department of Conservation, Springfield, Illinois. 20 pages.

Sawyer, C. D. 1970. Soils - The Dynamic Portion of Our Earth's Surface. Alberta Lands - Forest - Parks - Wildlife. Vol. 13, No. 1. Department of Lands and Forests, Edmonton, Alberta, Canada.

Smith, Philip W. 1971. Illinois Streams: A Classification Based on Their Fishes and an Analysis of Factors Responsible for Disappearance of Native Species. Biological Notes No. 76. Illinois Natural History Survey, Urbana, Illinois. 14 pages.

U. S. Department of Commerce. 1964. Climatic Summary of the United States - Supplement for 1951 Through 1960. Weather Bureau, Washington, D. C. 76 pages.

Wallace, Donald L., and Fehrenbacher, J. B. 1969. Soil Survey - Williamson County Illinois. U. S. Department of Agriculture, Washington, D. C., and Illinois Agricultural Experiment Station, Urbana, Illinois. 136 pages.

ADDITIONAL SOURCES OF DATA

Dr. Phil Smith, Illinois Natural History Survey (Records of Fish Collections)

Soil Conservation Service, U. S. Department of Agriculture

Agricultural Stabilization and Conservation Service, U. S. Department of Agriculture

Illinois Department of Conservation Files

Personal Interviews

GLOSSARY

ACRE FOOT - An area of one acre covered to a depth of one foot. One acre foot is 43,560 cubic feet or 325,851 gallons of water.

AESTHETICS - The overall scenic attraction of a lake setting; natural beauty of shores and waters, or any unusual natural phenomena; the appeal of its wildlife and aquatic plants.

ALGAE BLOOM - A bloom of algae (microscopic plants) may be so dense that it imparts a greenish, yellowish or brownish color to the water.

ALKALINITY - Ordinarily expressed as a pH above 7. Most water in the alkaline class has a range from pH 7.6 to 10.0. Alkalinity may be expressed as the amounts of carbonates, bicarbonates, and hydroxides present in the water.

ALLUVIUM - The sediments, or detrital matter, carried by inflowing streams and deposited on lake bottoms.

ANTICLINE - An arch of stratified rock in which layers bend downward in opposite directions from the crest.

AQUATIC PLANTS - Plants whose seeds germinate in the water or in the lake bottom soil; those that grow in water and are commonly grouped as floating, submersed and emersed.

AQUIFER - Any geological formation containing water, especially one which supplies the water for wells and springs.

ARTIFICIAL IMPOUNDMENT - Basins purposely excavated by man and filled with water by catchment from runoff, by pumping or by diversion of natural water bodies.

BASE FLOW - Flow in a stream when no runoff or precipitation is taking place.

BOD - The abbreviation for biochemical oxygen demand which is a measure of the amount of water soluble oxygen required by microscopic organisms to decompose a given amount of organic material in a specific amount of time.

COD - Abbreviation for chemical oxygen demand which is a measure of the chemically oxidizable organic matter in a given sample of water. The ratio between the BOD and COD is an indication of the relative proportion of biologically available organic matter in a given sample.

CARRYING CAPACITY - The maximum number (or weight) of organisms of a given species and quality which can survive in a given ecosystem through the least favorable environmental conditions that occur within a stated interval of time.

COMMERCIAL FISH - Fish that are caught by special tackle and sold.

CREEL CENSUS - Information obtained from anglers on their fishing success. A creel census can give information on fishing pressure, fishing quality, the total number and weight of fish being harvested, and the kind and size of fish being caught.

DERELICT LANDS - Those quarries, gravel pits and strip mines which have been abandoned or are depleted.

DO - An abbreviation for dissolved oxygen which is oxygen available in water for the survival of fish and other organisms.

DRAINAGE BASIN OR AREA - That part of a land area over which runoff water drains to a common point. See Watershed.

ECOLOGICAL - Pertaining to the interrelationship of living things and their environment.

ECOSYSTEM - A community of organisms, interacting with one another, plus the environment in which they live and with which they also interact; e.g. a pond, lake or stream.

EPHEMERAL - Lasting a very short time; short-lived; as applied to water areas - short-lived lakes and ponds.

EPILIMNION - In a thermally stratified lake, the turbulent layer of water that extends from the surface to the thermocline.

ESKER - A serpentine ridge of gravelly and sandy drift believed to have been formed by streams under or in glacial ice.

EUTROPHICATION - Enrichment of the water or lake soil. Increase in nutrients required for growth of organisms may come about by natural processes or rapid enrichment may take place due to some cause such as the introduction of sewage effluent. Eutrophic lakes are well provided with basic nutrients.

EVAPOTRANSPIRATION - The combined losses from a lake surface due to evaporation, sublimation, and transpiration from plant life.

FLATS - Water with slight to moderate current and with an unbroken surface but less depth than pools.

FLOODPLAIN - That part of a lake or stream basin lying between the shoreline and the shore cliff and subject to submergence during a high water stage.

FLUVIAL - Pertaining to streams and rivers.

FORAGE FISH - All small size fish used as food by larger fish.

GLACIAL DRIFT - Material of any sort deposited in one place by glacial action after having been moved from another location.

GLACIAL LAKE - A lake formed as a result of glacial action.

GLACIAL OUTWASH - Deposits made of materials produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting glacial ice. The deposits now exist as stratified beds of clay, sand, or gravel in the form of plains, valley trains, and deltas of old glacial lakes.

GLACIAL PLAINS - Glacial material that has been sorted or stratified by the meltwater of a glacier and is carried and deposited mainly as beds of clay, sand, and gravel to form plains.

GLACIAL TILL - A deposit of unstratified earth, sand, gravel, and boulders transported by glaciers.

GOB-PILE - The refuse area from a coal processing plant consisting of waste coal by-products, rock material and soil.

GRADIENT - The inclination from the horizontal of the lake bottom beginning at the shoreline. The slope of a stream over a given distance.

GRAVEL PIT - Lakes or ponds formed by the excavation of gravel.

GROUNDWATER TABLE - The upper limit of the part of the soil or underlying material wholly saturated with water.

HARDNESS (Water) - That quality in water which is imparted by the presence of dissolved salts; especially calcium sulfate or bicarbonate.

HOMOGENEOUS - Composed of parts all of the same kind.

HYPOLIMNION - In a thermally stratified lake, the layer of water below the thermocline and extending to the bottom of the lake. The water temperature is virtually uniform.

IMPOUNDMENT - A body of water ponded or held back by a dam, dike, floodgate, or any other barrier.

INTERMITTENT STREAM - A stream having water only part of the time.

KAME - A more or less rounded hill of sand and gravel associated with glacial deposits.

LACUSTRINE DEPOSIT - Materials deposited from lake water.

LAKE - A large body of water surrounded by land. The Illinois Department of Conservation classifies all impoundments six surface acres or larger as lakes.

LITTORAL ZONE - A narrow zone including both land and water immediately bordering the shoreline of a water area.

LOAM - A rich friable soil containing a relatively equal mixture of sand and silt and a somewhat smaller portion of clay.

LOESS - An unstratified deposit of yellowish-brown loam covering areas in North America, Europe, and Asia, now generally thought to be chiefly a wind-borne deposit.

MARSH - An area where water stands the year-round and is usually abounding in water weeds, cattail, bulrushes, and other emersed vegetation.

MGD - An abbreviation for million gallons per day.

MORAINE - A ridge, mound, or irregular mass of boulders, gravel, sand, and clay deposited by a glacier.

MORPHOMETRY - Measurements such as depth, length, width, volume, shoreline, and bottom gradients of a water area.

NATURAL LAKE - Any large impounded water area not formed by an act of man.

NURSERY STREAM - A TRIBUTARY STREAM USED BY SMALL FISH FOR PROTECTION AND FEEDING UNTIL THEY REACH MATURITY.

OXBOW LAKE - A LAKE OCCUPYING THE ABANDONED CHANNEL OF A LOOPING MEANDER OF A RIVER.

PARAMETER - A CONSTANT OR VARIABLE TERM IN A FUNCTION THAT DETERMINES THE SPECIFIC FORM OF THE FUNCTION BUT NOT ITS GENERAL NATURE.

PERMEABLE SOILS - SOILS CAPABLE OF ALLOWING THE PASSAGE OF WATER. A POROUS SOIL.

pH - THE SYMBOL FOR THE LOGARITHM OF THE RECIPROCAL OF HYDROGEN ION CONCENTRATION IN GRAM ATOMS PER LITER. A pH OF LESS THAN 7.0 IS ACID, A pH OF 7 NEUTRAL AND MORE THAN 7.0 IS ALKALINE. pH INDICATES THE ACIDITY OR ALKALINITY OF A MATERIAL.

PHOTOSYNTHESIS - THE PROCESS BY WHICH GREEN PLANTS USE SUNLIGHT, CARBON DIOXIDE, AND WATER TO PRODUCE CARBOHYDRATES AND OXYGEN.

PHYSIOGRAPHY - THE SCIENCE OF PHYSICAL GEOGRAPHY. A STUDY OF THE FEATURES AND NATURE OF THE EARTH'S SURFACE.

PLANKTON - A TERM FOR AN ASSEMBLAGE OF MICRO-ORGANISMS, BOTH PLANT AND ANIMAL, WHICH FLOAT, DRIFT, OR SWIM IN THE WATER AND IN THEIR MOVEMENTS ARE SUBJECT TO WAVE AND CURRENT ACTION.

POLLUTION - THE PRESENCE OF ANY FOREIGN SUBSTANCE IN WATER WHICH TENDS TO DEGRADE ITS QUALITY SO AS TO CONSTITUTE A HAZARD OR IMPAIR THE USEFULNESS OF THE WATER.

POND - A SMALL BODY OF WATER SURROUNDED BY LAND. THE ILLINOIS DEPARTMENT OF CONSERVATION CLASSIFIES ALL IMPOUNDMENTS LESS THAN SIX SURFACE ACRES AS PONDS.

POOLS - DEEPER PORTIONS OF A STREAM USUALLY WITH A SMOOTH SURFACE AND SLOW FLOW.

PPM - ABBREVIATION FOR PARTS PER MILLION IN TERMS OF UNITS OF WEIGHT. USED TO REPORT THE AVAILABILITY OR PRESENCE OF SALTS, NUTRIENTS, GASES AND TOXIC MATERIAL IN WATER.

PRIMARY PRODUCTIVITY - THE RATE AT WHICH ENERGY IS STORED BY PHOTOSYNTHETIC AND CHEMO-SYNTHETIC ACTIVITY OF PRODUCER ORGANISMS (GREEN PLANTS) IN THE FORM OF ORGANIC SUBSTANCES WHICH CAN BE USED AS FOOD MATERIALS.

REHABILITATION - TO RESTORE TO A GOOD CONDITION. IN THE CASE OF UNDESIRABLE FISH POPULATIONS, THE POPULATION IS REMOVED IN WHOLE OR PART IN ORDER TO RESTORE IT TO A GOOD CONDITION.

RELIEF - A CONTOUR VARIATION OF THE LAND SURFACE IN RELATION TO THE SURROUNDING LAND.

RIFFLES - SHALLOW BUT RAPID CURRENT OVER GRAVEL OR RUBBLE.

ROTENONE - A PLANT ALKALOID AND IS THE ACTIVE INGREDIENT IN DERRIS POWDER, CUBE, BARBASCO, AKAR TUBA, AND ALSO IN THE CURRENTLY AVAILABLE FISH TOXICANTS FOR USE IN KILLING FISH.

RUNS - MODERATE TO RAPID CURRENT FLOWING IN A DEEPER NARROWER CHANNEL THAN A RIFFLE BUT THE CURRENT IS NOT AS TURBULENT AS IN A RAPID.

SECCHI DISC - A CIRCULAR PLATE 20 CENTIMETERS IN DIAMETER THE UPPER SURFACE OF WHICH IS DIVIDED INTO FOUR EQUAL QUADRANTS AND SO POINTED THAT TWO QUADRANTS DIRECTLY OPPOSITE EACH OTHER ARE BLACK AND THE INTERVENING ONES WHITE. THE INSTRUMENT IS USED TO MEASURE LIGHT PENETRATION IN WATER.

SILTATION - THE FILLING OF WATER AREAS BY SEDIMENTS CARRIED IN BY INFLOWING SURFACE WATER.

SPORT FISH - ANY FISH THAT IS SOUGHT AFTER BY ANGLERS USING A POLE AND LINE.

STRATIGRAPHY - A BRANCH OF GEOLOGY DEALING WITH THE CLASSIFICATION, NOMENCLATURE, CORRELATION, AND INTERPRETATION OF STRATIFIED ROCKS.

STRIPMINE LAKE OR POND - WATER IMPOUNDMENTS RESULTING FROM COAL MINING OPERATIONS NEAR THE SURFACE OF THE GROUND.

SUBSTRATE - THE BOTTOM DEPOSITS OF A LAKE OR STREAM ON WHICH ORGANISMS MAY GROW.

SYNCLINE - SLOPING DOWNWARD IN OPPOSITE DIRECTIONS SO AS TO MEET IN A COMMON POINT OR LINE. A DOWNWARD FOLD OF ROCK STRATA.

TAILWATER - THE PORTION OF A STREAM IMMEDIATELY BELOW A DAM.

TERMINAL MORAINE - A RIDGE OF GLACIAL TILL MARKING THE FARTHEST ADVANCE OF A PARTICULAR GLACIER.

THERMAL STRATIFICATION - DIFFERENCES IN WATER TEMPERATURE FROM THE SURFACE TO THE BOTTOM IN WHICH DISTINCT LAYERS CAUSED BY TEMPERATURE GRADIENTS AND RESULTING CHANGES IN WATER DENSITY.

THERMOCLINE - THE STRATUM OF WATER IN WHICH THERE IS A RAPID RATE OF DECREASE IN TEMPERATURE WITH DEPTH; A MINIMUM OF ONE DEGREE CENTIGRADE PER METER OF DEPTH. THE THERMOCLINE IS LOCATED IMMEDIATELY BELOW THE EPILIMNION.

TOPOGRAPHY - THE DETAILED MAPPING OR CHARTING OF THE FEATURES OF A RELATIVELY SMALL AREA, DISTRICT, OR LOCALITY. THE RELIEF FEATURES OR SURFACE CONFIGURATION OF AN AREA.

TURBIDITY - THE DEGREE OF OPAQUENESS OF WATER DUE TO THE AMOUNT OF FINE MATTER IN SUSPENSION.

WATERSHED - THE WHOLE SURFACE DRAINAGE AREA THAT CONTRIBUTES WATER TO A STREAM OR IMPOUNDMENT.

WETLANDS - LAND FEATURES THAT ARE PERMANENTLY WET OR INTERMITTENTLY WATER COVERED SUCH AS SWAMPS, MARSHES, BOGS, MUSKEGS, POTHOLES, SWALES, GLADES, SLASHES, AND OVERFLOW LAND OF RIVER VALLEYS.

WINTERKILL - PARTIAL OR COMPLETE LOSS OF FISH AND ANIMAL LIFE OF A WATER AREA DUE TO THE FORMATION OF A COMPLETE ICE COVER CAUSING OXYGEN DEPLETION FROM WATER STAGNATION.

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